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AIR POLLUTION ABSTRACTS. VOLUME 4, NUMBER 2, FEBRUARY 1973, 25574-25767

Air Pollution Technical Information Center
Research Triangle Park, North Carolina

February 1973

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AIR POLLUTION ABSTRACTS

25574-25767

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16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 25574 - 25767.

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Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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The terms that most closely describe the information presented in the documents are arranged alphabetically.

Author Index AI-1

Personal authors are arranged alphabetically. The names are presented last name first. The title of the document is indented below the author's name; when the author is the first author of a title, an asterisk precedes the Abstract Number on the next line.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given.

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For non-EPA readers, APTIC can provide copies of only those articles that have been written by EPA's air pollution personnel and have not been published in the open literature. Requests for all other articles should be directed to local libraries, publishers, or authors, with the following exception. Copies of EPA's air pollution technical publications in the AP or APTD series, as indicated in the citation, will be provided, while supplies permit, only to certain qualified requesters, e.g., its current contractors, grantees, and air pollution control agencies; a list of these publications is available on request. When requesting any publications from the APTIC, please include the complete citation.

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The serial publications (journals, periodicals, etc.) which are regularly screened for input are listed with their publishers' addresses in one issue in each volume of our abstract bulletin; the most recent list appeared in the December 1971 issue.

As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Feedback from our users, including suggestions of articles for abstracting, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45. Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

Nitrogen Oxides: An Annotated Bibliography, August 1970, GPO No. HE 20.1309:72, $2.75.

Air Pollution Translations: A Bibliography With Abstracts Volume I, May 1969, GPO No. FS 2.93/3:56, $1.75.

Air Pollution Translations: A Bibliography With Abstracts Volume II, April 1970, GPO No. HE 20.1309:69, $1.00.

Carbon Monoxide, A Bibliography With Abstracts. 1966, GPO No. PHS 1503, $2.50.

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RECENT CONTRACT AWARDS

from the

Durham Contract Operations
Contracts Management Division, EPA

Contract No. 68-02-1015, RFP Du-73-A002 ..... *$30,476*
INVESTIGATION OF THE GEOPHYSICAL CHARACTERISTICS AND ENERGY BUDGET OF THE URBAN SURFACE.
Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California 94025

Contract No. 68-02-0609, RFP No. Du-72-A124 ..... *$54,970*
EVALUATION OF THE EPA MANUAL PARTICULATE SAMPLING TRAIN.
Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-0632, RFP No. Du-72-A124 ..... *$113,960*
EVALUATE THE EPA MANUAL PARTICULATE SAMPLING TRAIN APPLIED TO SELECTED STATIONARY SOURCES.
Arthur D. Little, Inc., Acorn Park, Cambridge, Massachusetts 02140

Contract No. 68-02-0633, RFP No. Du-72-A124 ..... *$84,885*
EVALUATE THE EPA MANUAL PARTICULATE SAMPLING TRAIN APPLIED TO SELECTED STATIONARY SOURCES.
Monsanto Research Corporation, 1515 Nicholas Road, Dayton, Ohio 45407

Contract No. 68-02-0710, RFP No. Du-73-B306 ..... *$80,000*
METABOLIC STUDIES OF ATMOSPHERIC LEAD ON HUMAN VOLUNTEERS.
Albany Medical College, 47 New Scotland Avenue, Albany, New York 12208

Contract No. 68-02-0668, ... *$203,606*
COMMUNITY HEALTH AND ENVIRONMENTAL SURVEILLANCE SYSTEM (CHESS) - BIRMINGHAM.
Board of Trustees of the University of Alabama, University of Alabama, 1919 Seventh Avenue South, Birmingham, Alabama

Contract No. 68-02-1013, RFP No. Du-73-A020 ..... *$179,969*
INVESTIGATION OF METHODS FOR CONTROL OF SCALING IN LIMESTONE SCRUBBING PROCESSES.
Arthur D. Little, Inc., 20 Acorn Park, Cambridge, Massachusetts 02140

Contract No. 68-02-0293, RFP No. Du-72-A131 ..... *$91,375*
DEMETALIZATION OF RESIDUAL OILS.
Hydrocarbon Research, Inc., New York and Puritan Avenues, Trenton, New Jersey 08638

Contract No. 68-02-1014, RFP No. Du-73-A009 ..... *$53,811*
PREPARATION OF AREA SOURCE EMISSIONS DISTRIBUTIONS FOR SIXTEEN AIR QUALITY CONTROL REGIONS.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-0729..... *$45,231*
AIR POLLUTION CONTROL EMPLOYMENT BULLETIN.
Ability Search, Inc., 1629 'K' Street, North West, Washington, D. C. 20006

Contract No. 68-02-0660..... *$26,718*
FIELD STUDY OF IN-STACK TRANSMISSOMETER MEASUREMENT OF PLUME OPACITIES.
Fecker Systems Division, Owens-Illinois, Inc., 4709 Baun Boulevard, Pittsburgh, Pennsylvania 15213

Contract No. 68-02-0292, RFP No. Du-73-A011..... *$392,529*
CATALYTIC REDUCTION OF NOx IN SULFUR-FREE COMBUSTION FLUE GASES WITH AMMONIA, PILOT PLANT OPERATION.
Environics, Inc., 7424 Lorge Circle, Huntington Beach Orange County, California 92647

Contract No. 68-02-0716, RFP No. Du-73-B282..... *$33,848*
CONSTRUCTION AND FIELD TESTING OF A COMMERCIAL PROTOTYPE DISC DILUTER.
Monsanto Research Corporation, 1515 Nicholas Road, Dayton, Ohio 45407

Contract No. 68-02-1066, RFP No. Du-73-A025..... *$175,000*
DEVELOPMENT OF ENGINEERING ANALYSIS PROCEDURES.
InterTechnology Corporation, P. O. Box 340, Warrenton, Virginia 22186

Contract No. 68-02-0648, RFP No. Du-72-A114..... *$133,214*
TECHNICAL AND ECONOMIC ASSESSMENT FOR CONTROL OF NOx FROM STATIONARY POWER PLANTS BY USE OF CATALYSTS.
TRW Inc., One Space Park, Redondo Beach, California 90278

BOA No. 68-02-1001, Task Order No. 1..... *$25,000*
PROGRAMMING SUPPORT AND DATA EVALUATION OF NEDS DATA FORMS.
PEDCo-Environmental Specialists, Inc., Suite 8, Atkinson Square, Cincinnati, Ohio 45246

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

19,2

25574 **APTIC NO. 47187**

Dept. of Interior, Washington, D. C., Energy Study Working Group

UNITED STATES ENERGY. A SUMMARY REVIEW. *48p., Jan. 1972. 54 refs.*

GPO

Domestic energy demand forecasts show a 3.5% compounded annual growth rate between 1970-200, representing a three-fold increase in energy consumption from 68,810 trillion Btu for 1970 to 191,566 trillion Btu for 2000. Electric power demand has doubled in the past ten years and is growing faster than new capacities are built. Environmental concerns are limiting the supply of acceptable fuel. Coal continues to be the main fuel supply but its share has decreased from 65% in 1960 to 55% in 1970 and will continue to fall. Natural gas demand has increased at rates greater than any other primary fuel and it should remain the primary source of gaseous fuel through 1985. Petrpleum consumption is also increasing at a greater rate than can be supplied by domestic production. It is expected that nuclear fuel will replace fossil fuels as the primary energy source by 2000. The hydroelectric contribution to long-term energy needs is expected to decline proportionately. Other promising energy sources include geothermal energy, solar power, controlled thermonuclear fusion, tidal energy, and fuel cells; however, these have not progressed beyond the experimental or limited development stages.

25575 **APTIC NO. 47271**

INVESTIGATION ON THE DEVELOPMENT OF PLASTIC INCINERATORS. *(Hai-purasuchikku shokyaku no kaihatsu jittai chosa). Text in Japanese. Kogaku Kojo (Chem. Factory), 16(7):53-58, July 1972.*

Questionnaires were sent to 83 incinerator manufacturers to see how many of them were involved in the design, development, and manufacture of incinerators specially designed for plastics or for waste containing plastics. The present urban waste is said to contain 9 to 12% plastics. Only 34 replies were received, of which 18 were manufacturers of plastic incinerators. The design specifications, capacity, methods of combustion, scale, performance, construction cost, maintenance cost, incinerator material, and various other features of the incinerators are presented in a table. According to the table, the hydrogen chloride concentration in combustion gases ranged from 0 to 20 ppm; the amount of dust in the combustion gases ranged from 0 to 250 mg/N cu m.

25576 **APTIC NO. 47111**

Algar, P. M. S.

TRANSPORT AND THE FUTURE IN THE UK. *Petrol. Rev., 26(308):252-260, Aug. 1972.*

Whilst there will be dramatic changes over the next 15 years, the car will probably remain dominant and innovations will take many years to have a profound impact on the total transport scene. Statistics are given concerning the growth of automobile usage in the United Kingdom, as well as motoring costs, repair costs, and gasoline prices. Factors influencing ownership and utilization of the car are discussed. Alternatives to the automobile are considered, such as the cab-truck system and automatic guidance. The car of the future is described, including its various safety factors. Electric cars and cars designed to run on propane are mentioned.

25577 **APTIC NO. 47183**

Annamalai, K., V. Kuppu Rao, and A. V. Sreenath

NOMOGRAMS FOR THE ESTIMATION OF MAXIMUM POSSIBLE LEVELS OF CARBON MONOXIDE IN THE COMBUSTION PRODUCTS OF HYDROCARBON FUELS. *J. Inst. Fuel, 15(371):48-51, Jan. 1972. 2 refs.*

A general theoretical analysis is presented of the combustion products of hydrocarbon fuels; the amount of carbon monoxide formed can be determined when the quantities of carbon dioxide and oxygen gases in the products and the weight fraction of carbon in the fuel are known. The air utilization factor as obtained in the Ostwald Diagram does not actually represent the degree of air utilization by fuel; however, it does indicate the degree of fuel utilization. Nomograms are presented for the evaluation of CO, fuel utilization factor, and air utilization factor for fuels whose carbon weight fractions are within the range of 0.7 to 1.0. (Author abstract modified)

25578 **APTIC NO. 47285**

Bachl, H.

A SHORT INTRODUCTION TO THE ENVIRONMENTAL PROBLEMS OF THE CITY OF MUNICH. *(Kurze Einfuehrung in Muenchner Umweltprobleme). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 184:5-10, 1972.*

Environmental problems of the city of Munich are outlined with special regard to the energy supply system. While Munich accommodates no polluting industries, long-lasting inversions, especially in the winter periods, have unfavorable effects. Though both the energy supply and heating systems are based mainly on coal, its proportion will drastically drop in the near future as a result of the beginning extensive use of natural gas, oil, and atomic energy. Tw thermal power plants located within the metropolitan limits, originally designed for coal, now accept municipal waste, oil, and natural gas which account for 80% of the total fuel demand. Wastes are incinerated mainly in high pressure power plants for effective waste heat utilization. The respective proportions of electricity, remote heat, and natural gas in domestic heating are 2%, 10%, and 23%, which resulted in a decrease in the sulfur dioxide level over the last few years. Steam from a nuclear power plant is utilized for remote heating purposes.

25579 **APTIC NO. 47261**

Dalmon, J. and E. Raask

RESISTIVITY OF PARTICULATE COAL MINERALS. *J. Inst. Fuel, 45(374):201-205, April 1972. 8 refs.*

The electrical resistivity of ash is one of the basic parameters which governs the performance of electrostatic precipitators for pulverized coal-fired boilers. The electrical resistivity of the ground mineral components of ash in coal was measured at electrostatic precipitator temperatures before and after dropping them through a vertical high-temperature furnace. The minerals were composed of silicon, aluminum, iron, calcium, magnesium, potassium, and sodium oxides. The resistivity

of the unheated minerals was influenced by the presence of water in the silicate structure. The resistivity of non-hydrated silicates was around 10 to the 12th power ohm m, and that of hydrated silicates was lower by about three orders of magnitude. After high temperature treatment, quartz, kaolin, kyanite, and muscovite retained their insulating properties, but chlorite, illite, and albite had their resistivities reduced by a factor of 1000. This reduction was caused by iron and sodium in these minerals. A thin coating of iron oxide on the particles of quartz and kyanite reduced the surface resistivity by four orders of magnitude. (Author abstract modified)

25580 **APTIC NO. 47196**

Diehl, R. C., E. A. Hattman, H. Schultz, and R. J. Haren

FATE OF TRACE MERCURY IN THE COMBUSTION OF COAL. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center Managing Coal Wastes and Pollution Program TPR-54, 11p., May 1972. 11 refs.*

Coal, fly ash, and flue gas samples were analyzed for mercury by double gold amalgamation-flameless atomic absorption spectrophotometry to determine the fate of trace mercury when coal is combusted. Samples were collected from two bench-scale combustors and three coal-burning power plants. In all cases, mercury was determined in the fly ash in amounts ranging within about 9-70% of the mercury contained in the coal that was burned. (Author abstract modified)

25581 **APTIC NO. 47112**

Hansen, Charles M.

SOLVENTS FOR COATINGS. *Chem. Technol., 2(9):547-553, Sept. 1972. 49 refs. (Presented at the American Chemical Society, National Meeting, New York, N. Y., 1972.)*

The newer concepts and techniques of using solvents in the coatings industry are discussed. There are many criteria to be met before a solvent composition is finally worked out for a given application. The most common current goal is to arrive at the least expensive blend which meets the requirements of volatility, solvency, and air pollution regulations. Current regulations limit the use of aromatic hydrocarbons, solvents containing olefinic unsaturated, substituted aromatics, ketones with a tertiary hydrogen atom, and trichloroethylene. Solubility relationships, determination of the polymer solubility parameter, use of solubility parameter data, and surface characterization are discussed. Potential applications of the solubility parameter are indicated.

25582 **APTIC NO. 47262**

Hansrani, S. P. and G. P. Richard

AN EVALUATION OF THE EFFECT OF OXY-FUEL TECHNIQUES ON THE LD STEELMAKING PROCESS. *J. Inst. Fuel, 45(377):406-414, July 1972. 8 refs.*

Oxy-fuel techniques are useful when applied to the electric arc furnace in place of plain oxygen lancing at the end of the heat. The production of visible red oxide fume is reduced, and although the use of oxy-fuel has required the use of longer blowing periods than are experienced with oxygen alone, this disadvantage is not serious enough to preclude the use of the technique. An oxy-fuel burner was used in place of an oxygen lance in the LD steelmaking process. Since much more oxygen is used in the LD process than in electric arc steelmaking, particular attention was paid to the effects that the use of oxy-fuel has on refining time, oxygen consumption, and metal yield. In addition, quantitative measurements of the weight of the fume produced were undertaken in order to study the effects of process variables on fume formation. Results indicate that the rate of formation and the refining time are controlled essentially by the flow rate of oxygen available for steel refining. The effect of injected oil was to reduce the availability of oxygen for steel refining by 1.25 N cu m/l oil; if available oxygen flow was calculated on this basis, no other effect of oil injection could be detected. (Author abstract modified)

25583 **APTIC NO. 47211**

Karim, G. A. and M. V. D Souza

THE COMBUSTION OF METHANE WITH REFERENCE TO ITS UTILIZATION IN POWER SYSTEMS. *J. Inst. Fuel, 45(376):335-339, June 1972. 29 refs.*

The main combustion problems associated with the use of liquefied natural gas as an engine fuel are reviewed. The high temperature oxidation of methane is considered, and an analytical model is developed to investigate the combustion of methane in a flow system using a reaction scheme consisting of 24 reaction steps and involving 15 species. Over the range of conditions investigated, calculated values of the induction period agreed well with experimental results reported in the literature. Moreover, the calculated concentration profiles indicated trends similar to those observed experimentally by other workers. Three main phases were observed -- the depletion of methane; formation of water, carbon monoxide, hydrogen, and H2CO; and conversion of CO to carbon dioxide. (Author abstract modified)

25584 **APTIC NO. 47150**

Kutsuma, Junji

SECONDARY POLLUTION BY WASTE LANDFILL - A REPORT ON INVESTIGATION OF REFUSE BATTLES. *(Gomi no umetate ni yoru haikibutsu no niji - kogai gomi senso, sono chosa hokoku). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 8(10):20-28, Oct. 1972.*

The excavation holes made by sand and pebble dealers in the Tama riverbed have been used for city refuse landfill for the last several years. Recently, inhabitants of Musashi-Murayama City have complained about the secondary pollution caused by methane gas obviously leaking from such landfill sites. The extent of pollution by methane and carbon monoxide was measured. Methane was sampled by 5 cc injection needles and analyzed by gas chromatography. The CO was sampled by a mylar bag and was analyzed by the nondispersion infrared absorption method. The methane concentration ranged between 100 to 30,000 ppm. The maximum concentration at 1.5 m height from the ground was 69.6 ppm and the maximum at 5 m was 38.5 ppm. There were possibilities of methane infiltrating cesspools of the houses in the area, which might have caused an explosion in the kitchens and bathhouses when leaked through the drainage systems. The CO was detected in the range between 3 to 20 ppm, the highest concentration being in the cesspools. Botanists concluded that a blight to the chestnut trees in the area was caused by the land heat, insufficiency of oxygen, and insects as well as the high concentration of CO in the soil.

25585 **APTIC NO. 47148**

Ordinanz, Wilhelm

COMPILATIONS OF EMISSION CHARACTERISTICS IN THE USA. *(Mitteilungen ueber Emissions-Kennzahlen in den USA). Text in German. Staub, Reinhaltung Luft, 32(10):399-400, Oct. 1972. 2 refs.*

The German literature provides only scattered data on the gaseous emissions of power plants, steam boilers, industrial furnaces, and incinerators. The Technical Directives On the Maintenance of Clean Air and numerous VDI guidelines supply only maximum allowable dust concentrations in emissions. In the United States, however, emission inv ntories are available for several industrial areas. The emission characteristics of coal-fired furnaces, of metallurgical processes of fuel-oil-fired and natural-gas-fired furnaces, and incinerators are listed in tables. In another table the emissions of frequent working processes such as welding, lacquering, degreasing, and drying are listed. Pollutants include nitrogen oxides, par-

ticulates, sulfur oxides, carbon monoxide, aldehydes, benzopyrenes, ammonia, and organic acids.

25586 **APTIC NO. 47147**

Riedlinger, Rudolf A.

THE JET PEAK DEMAND POWER PLANT DUESSELDORF-FLINGERN. *(Das Jet-Spitzenkraftwerk Duesseldorf-Flingern). Text in German. Energie Tech., 24(10):299-308, 1972.*

The new power plant in Duesseldorf - Flingern has been equipped with a steel jet-operated gas turbine for covering peak power demands. It is located 130 m from a residential area. The gas turbine is operated with natural gas or fuel oil so that hardly any dust is emitted. When the combustion process is badly adjusted, soot is emitted. The fuel oil used has a sulfur concentration of 0.4 to 0.6%. Based on the sulfur dioxide background concentration at the plant, the stack height was calculated to be 55 m. This height guarantees sufficient dilution of the waste gases so that the vegetation in the vicinity is not injured. Recently special combustion chambers have been installed where an optimum mixing between fuel and air is achieved and no soot development must be feared. A detailed description of the entire plant is given. (p. 300 directly concerns air pollution.)

25587 **APTIC NO. 47114**

Rogers, Paul and Lazlo Heller

DRY-TYPE HYPERBOLIC COOLING TOWER. *Civil Eng. (N. Y.), 42(10):56-57, Oct. 1972.*

With major installations in Europe and the USSR, the dry-type cooling tower for power plants allows for freedom of plant location while minimizing the environmental effects of power generation. The Heller system developed by one of the authors is the most efficient dry-type tower. Its jet condenser is a direct contact condensing system which mixes the condensate feedwater with the cooling water. Since all the water is purified and scaled, it is reusable forever with virtually no maintenance. An ecological evaluation of wet-type cooling towers is given including contamination of the air by combustion products.

25588 **APTIC NO. 47259**

Saito, Takeshi

CENTRALIZED REGIONAL HEATING SYSTEM AS AN AIR POLLUTION COUNTERMEASURE. *(Taiki osen taisaku to shite no chiiki danbo). Text in Japanese. Rodo no Kagaku (Dig. Sci. Labor), 27(2, 3):9-13, Feb.-March 1972.*

A method used recently as a solution for urban air pollution problems is centralizing the area s heating systems. This has been found especially effective in northern Japan where heating systems have created much air pollution. The medium (steam or hot water), the piping system (single or double pipes), and heat load (degree day) are discussed with references to European countries. The irrationality of air regulations determined by the K indexes is criticized. The nitrogen oxide concentration daily fluctuation in Sapporo shows an interesting phenomenon in the winter. From spring to fall, the fluctuation occurs minimally; during winter months, high peaks appear during morning and evening hours. This pattern coincides well with the sulfur dioxide daily fluctuation patterns during winter months. The phenomena indicate that the NOx concentration in Sapporo comes mainly from boiler stoves rather than from automotive emissions. The centralized heating system for Sapporo started in 1969, and the boiler plant is already functioning. The total construction plan is to be completed in 1974. The plans, costs, and projected air pollution transition are presented.

25589 **APTIC NO. 47272**

Shebzukhov, D. A., A. A. Bogdasarov, and A. S. Serebryakov

STUDYING THE ELECTRIC AND PHYSICO-MECHANICAL PROPERTIES OF DUSTS OCCURRING IN THE PRODUCTION OF MERCURY. *(Issledovaniye elektricheskikh i fiziko-mekhanicheskikh svoystv pyley rtutnogo proizvodstva). Text in Russian. Tsvetn. Metal., no. 9:27-30, 1972. 7 refs.*

Chemical, electric, and physico-mechanical properties of dusts separated in settling chambers and cyclones after a roasting furnace processing mercuriferrous ores were studied. The dust emission from the furnace amounted to 2-7% of the ore processed, corresponding to a concentration of 68-80 g/N cu m. The efficiency of the settling chamber and of the cyclone was 6% and 80-90%, respectively. The separated dust contained metallic mercury due to condensation, secondary mercuric sulfide, cinnabar, antimonite, oxidized antimoniferous minerals, quartz, marcasite, hematite, magnetite, and iron hydroxides. Cinnabar finely dispersed in quartz, and high iron mineral content, were the characteristic features of the dust. The respective percentages of the 0-5, 5-10, 10-20, 20-30, 30-40 and 40-50 micron fractions of the cyclone dust were 14.6, 18.3, 25.2, 14.2, 11.0, and 9.4%. The electric resistivity of the dust was very high, depending on the moisture content. Experiments revealed the possibility to use an electrostatic precipitator for the final dust separation from roasting furnace waste gases. The optimum conditions were an electric resistivity of about 100 billion Ohm cm and a temperature range of 300-346 C.

25590 **APTIC NO. 47288**

Steinbiss, E.

PRESENT POSITION AND DEVELOPMENT OF CLINKER COOLERS. *(Stand und Entwicklung der Klinkerkuehler). Text in German. Zement-Kalk- Gips (Wiesbaden), 25(11):519-529, Nov. 1972. 11 refs.*

Newer forms of construction for rotary cement kilns equipped with grate coolers are the stepped cooler with one inclined and two horizontal grates with a clinker crusher between them, and the travelling grate cooler with an initially steeply rising grate which achieves better cooling and distribution of the hot clinker discharge from the kiln at high throughputs. Grate coolers are designed for throughputs of 26-34 t/sq m d active grate surface area and for a maximum cooling air rate of 3.0 N cu m/kg. The specific electric power consumption is 3.5-5.5 k Wh/t; the thermal efficiency is 64-70% or higher. If part of the cooling air is double-passed through the grate, a reduction in the exhaust air quantity and heat losses is achieved. To avoid the difficulties and expense of dust removal from large grate coolers, there has been a trend towards types of coolers from which no exhaust air is discharged. These include the planetary cooler, which is characterized by simplicity of design and simplicity in terms of process technology. Clinker discharge temperatures and thermal efficiencies of planetary coolers are approximately the same as for grate coolers, but the specific electric power consumption is lower (0.5 to 1.3 k Wh/t). Other types of clinker coolers without exhaust air discharge include a new tubular cooler for 2000 t/day, a newly developed shaft cooler for 500-3000 t/day, and a new indirect cooler with cooling ribs through which air flows for 2000 t/day.

1971

25591 **APTIC NO. 47139**

Friedlander, S. K.

CHEMICAL ELEMENT BALANCES AND THE IDENTIFICATION OF AIR POLLUTION SOURCES. *Preprint, California Inst. of Tech., Pasadena, 28p., 1971. 16 refs. (Presented at the Conference on Science in the Control of Smog, Pasadena, Calif., Nov. 15-16, 1971.)*

Air pollution sources of given types, whether natural or man-made, emit a characteristic set of chemical elements in approximately fixed proportions. If the sources in a polluted region are known, the contributions from each source can be estimated by measuring elemental concentrations at a given point and solving a set of simultaneous linear algebraic equations. The method was applied to particulate matter measured in the air of Pasadena over an 11-hour period and averaged over particle size. For the test period, about 15% of the particulate matter resulted from primary natural sources and 25% from primary man-made sources. Sources included sea salt, soil dust, automobile exhaust fuel oil fly ash, Portland cement, and tire dust. About 1/3 of the total resulted from atmospheric reactions with 1/4 produced by the conversion of gas phase hydrocarbons to particulate form. The estimate for this figure is based on a carbon balance. About 70% of the total particulate burden was accounted for, with water probably making up a significant portion of the missing 30%. Improvements and extensions of the method are discussed. (Author abstract modified)

25592 **APTIC NO. 47138**

Hardy, G.

THE ST6 VEHICULAR EXPERIENCE. *Preprint, American Society of Mechanical Engineers, New York, 21p., 1971. 11 refs. (Presented at the American Society of Mechanical Engineers, Gas Turbine and Fluids Engineering Conference and Products Show, San Francisco, Calif., March 26-30, 1972, Paper 72-GT-72.)*

Experience with the ST6 gas turbine engines, derived from PT6 aero engines, has lead to the development of operating characteristics and design features which have improved its performance and reliability. The ST6 has been used in trains, off-highway equipment, racing cars, and trucks, and as further turbine development yields lower ownership costs and pollution characteristics, it may be used in passenger cars. Features of the ST6 engine are discussed, including performance, fuels, corrosion protection, low noise levels, and improved hot section life. The basic PT6 engine has no visible smoke emission due to a stoichiometric to lean mixture in the primary zone. Levels of unburned hydrocarbons, carbon monoxides, and aldehydes are comparable with other current gas turbines. Oxides of nitrogen at high power are lower than for other current turbines when corrected for fuel/air ratio. This low NOx content is attributed to the PT6 flametube design. A method for rating the engine life as a function of rated power level and operating characteristics is discussed.

1970

25593 **APTIC NO. 47143**

Stanford Univ., Calif., Stanford Workshop on Air Pollution

AIR POLLUTION IN THE SAN FRANCISCO BAY AREA. (FINAL REPORT). *385p., 1970. 72 refs.*

The state of the air pollution problem in the San Francisco Bay area, with respect to the chemical nature, potential effects, sources, and occurrence of air contaminants, administrative aspects, public affairs, air pollution control devices, and research projects, is examined. The major pollutants include particulate matter; sulfur oxides; carbon monoxide; nitrogen oxides; organics (hydrocarbons); photochemical reaction products, e.g., smog, ozone, and peroxyacyl nitrates; and other pollutants such as lead particles, hydrogen sulfide, fluorides, and various metals. The sources considered included automobiles, petroleum operations, chemical plants, metallurgical and mineral industries, combustion operations, electric power production, and organic solvent users. Complete air quality and emission data are included. Other sources of pollution, collectively significant, consist of automobile service stations, incineration, domestic heating, agricultural burning, and non-highway transportation. The administration of the control district and citizens groups were examined and rated; suggested plans for future activities are presented.

25594 **APTIC NO. 47140**

Beckman, J. A., D. J. Bennett, A. G. Altenau, and J. R. Laman

YIELDS AND ANALYSES OF THE PRODUCTS FROM THE DESTRUCTIVE DISTILLATION OF SCRAP TIRES. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, vol. 10:195-202, 1970.*

The feasibility of the disposal of scrap rubber such as tires by destructive distillation and recovery of valuable material was demonstrated in a laboratory study. Products from the distillation were varied by changing the types of materials used, size of material, and temperature. Higher temperatures increased the yields of char and gas. At 900 C, the heavy oil obtained was more viscous than that obtained at lower temperatures, the yield was lower, and there was more light oil. The larger the particle size, the faster the material degraded. The gas obtained at 500 C contained more of the higher heat content gases ethane, propane, and propene than did the 900 C run; the latter produced more of the lower heat content gases, hydrogen and methane. High temperature decreased the percentage of lower boiling compounds in the light oils; the lighter components were either cracked completely to carbon and hydrogen or were carried on through the collection train into the gas collection reservoir. Very high aromatic content oil was produced at 900 C relative to that produced at 500 C. The truck tire runs, which were higher in natural rubber content, contained a lower percentage of aromatic hydrocarbons than the passenger tire runs. Runs at 500 C produced the highest yields of low boiling fractions in the heavy oils. Larger particles decreased the yields of heavy oils and the percentage of lower boilers in the heavy oils. High temperature increased the yield of char but made little difference in the quality. The surface area of char increased with carbonization temperature.

25595 **APTIC NO. 47135**

Russo, Robert S.

CHATTANOOGA INTERSTATE AIR QUALITY CONTROL REGION. *National Air Pollution Control Administration, Washington, D. C., Federal Facilities Branch, APTD-0992, 15p., June 1970. 6 refs.*

NTIS: PB 209717

The status of Federal facilities in the Chattanooga Interstate Air Quality Control Region as of April 12, 1969, is presented. Data are included on open burning and incineration disposal of refuse and fuel use (gas, distilled oil, residual oil, and coal). Abatement plans are mentioned. The Federal facilities emit 710 tons of sulfur oxides, 11,000 tons of nitrogen oxides, 6 tons of carbon monoxide, 40 tons of particulates, and 4 tons of hydrocarbons per year. Compared with all other sources in the region, Federal facilities emit approximately 2% of all particulates, 6.9% of all SOx, and negligible % of all CO. Data are unavailable for NOx comparison, but the Federal contribution is very large. The Volunteer Army Ammunition Plant is the only Federal facility in the region with air pollution problems. Proposed abatement measures in their 1968-1973 5-year plan are given.

CONTROL METHODS

1972

25596 **APTIC NO. 47103**

VENTURI SCRUBBER SYSTEM REMOVES SULPHUR OXIDES, HCL VAPOR AND ASH PARTICLES FROM INCINERATOR EXHAUST GASES. *Ind. Heating, 39(9):1821-1822, Sept. 1972.*

A venturi scrubber system removes sulfur oxides, hydrochloric acid vapor, and ash particles from 155 F gases exhausted by a new municipal incinerator at New Canaan, Connecticut.

In addition to the venturi scrubber, the system also includes a moisture separator, an induced draft fan, an exhaust stack, and interconnecting ducting and piping. Construction materials and venturi operation are discussed.

25597 **APTIC NO. 47104**

VACUUM CARBURIZING (HIGH TEMPERATURE). *Ind. Heating, 39(9):1650-1654, Sept. 1972.*

Vacuum carburizing is the newest and most unique method for the hardening of metals. The metal is heated above the critical temperature in a vacuum and then enveloped in a hydrocarbon atmosphere which provides carbon addition to the surface of the metal. The gaseous atmosphere, when introduced into the new vacuum furnace--after passing through its own pre-purifying unit--reacts to provide carbon on the hot surfaces of the metal. This carbon is readily absorbed and diffused into the surface of the metal. There is no pollution of the environment because the cold wall vacuum furnace prevents flue gas and unused compounds from becoming contaminants.

25598 **APTIC NO. 47180**

Q-BOP: FROM BLOW TO GO IN 90 DAYS. *J. Metals, 24(3):31-34, March 1972.*

Several U. S. Steel plants are installing German-invented bottom-blown oxygen converters (Q-BOP) for steelmaking. The Q-BOP converters are essentially Bessemers. They are low in capital and operating costs and are readily adaptable to existing open hearth shops. These factors will enable the open hearth shops to reduce air pollution by installing the Q-BOP converters and expensive pollution controls. The Fairfield Works caused substantial air pollution, exacerbated by its topographic location. Two 200-ton Q-BOP vessels will be installed at this plant.

25599 **APTIC NO. 47281**

Abe, Saburo and Shosuke Miyamoto

DESULFURIZATION METHOD OF WASTE GAS. *(Haigasu no datsuryu hoho). Text in Japanese. (Toyo Engineering Co., Tokyo (Japan)) Japan. Pat. Sho 47-45671. 4p., Nov. 17, 1972. (Appl. Feb. 26, 1969, 1 claim).*

This method was designed to improve the economy of the wet-type waste gas desulfurization process in which the hot waste gas has to be cooled to 50 C or preferably 40 C or below for effective scrubbing with ammonium water solution and then the treated gas has to be heated for effective atmospheric diffusion. Basically, this method is a wet-type desulfurization method in which the hot waste gas is cooled to a temperature level appropriate for scrubbing with an ammonia water solution, then scrubbed with the ammonia water solution to get the sulfur dioxide or sulfur trioxide content of the gas transferred into the solution, after which the treated gas is discharged into the atmosphere while the SO2 and SO3 taken into the solution are later recovered. The hot gas taken into the desulfurization process system is first cooled to an intermediate temperature through the indirect heat exchange with the already treated gas, thereby heating the treated gas to a temperature level suitable for the atmospheric diffusion of the gas at the same time. In the second-stage cooling that follows, the waste gas cooled to an intermediate temperature is contacted directly with cooling water; both the dust removal and cooling of the gas are performed simultaneously. During this second-stage cooling, the cooling water is controlled to hold its temperature at 45 C to 75 C with its hydrogen ion concentration index kept below eight, so that sulfur oxides contained in the waste gas, will not move into the cooling water. The waste gas cooled to a suitable temperature level, and is scrubbed with the ammonia water solution for desulfurization.

25600 **APTIC NO. 47274**

Adama, Robert J. and Carson L. Brooks

TRIGAS FLUXING. *J. Metals, 24(8):21-24, Aug. 1972.*

Fluxing of molten metal with a mixture of chlorine, carbon monoxide, and nitrogen (trigas) to remove suspended nonmetallic particles, as well as hydrogen gas, is described for the manufacture of aluminum. This mixture of three gases also dramatically reduces the amount and visibility of stack effluent as compared with that from chlorine fluxing. The results of test runs with a trigas system are indicated, and compared to results from a chlorine system.

25601 **APTIC NO. 47124**

Arimitsu, Tomoharu

DUST PREVENTION AT IRON MANUFACTURING FACTORY. *(Seitetsusho no funjin boshi taisaku). Text in Japanese. Association for the Prevention of Industrial Public Nuisance (Japan), Proc. Assoc. Prev. Ind. Pub. Nuisance, Symp., 2nd, Japan, 1972, p. 41-48. (Oct. 3-7.)*

At the Kakogawa plant of the Kobe Steel Manufacturing Co., a total of 60 electrostatic precipitators are used at various dust producing areas such as the raw material area, pellet area, blast furnace area, converter area, lime area, pressure area, and alloy area. Most dusts are from the iron oxide and ferrous alloy fumes in the area of the blast furnace, converter, and the alloy electric furnace. The fume generally contains less than 1 micron dusts. For the collection of small particles, wet-type electrostatic precipitators were installed for the first time in Japan. The rate of collection at these areas is the highest in Japan. Problems experienced so far have been studied and corrected. The most difficult problem was the dust dispersion in the area of hoods and the clogging of ducts. The hood designs had to be changed. The clogging of ducts was caused by poor design of the duct or the wetness of the gas, which were corrected.

25602 **APTIC NO. 47149**

Bauer, Uwe

ABSORPTION OF NITROGEN OXIDE GASES IN A PLATE COLUMN. *(Absorption nitroser Gase in Bodenkolonnen). Text in German. Chem. Tech. (Berlin), 24(8):464-469, Aug. 1972. 6 refs.*

Plate columns for the absorption of nitrogen oxides for nitric acid production have the advantage of being reliable, simple to handle and to monitor, of producing a higher acid concentration than packed columns, and of leaving a low nitrogen oxide gas concentration in the waste gas. The main features of the absorption process are outlined. The major types of plate columns suitable for the nitrogen oxide gas absorption are briefly described. Deflection current plate columns are increasingly coming into use. The plate column with negative transport effect is also very suitable for this purpose. Its disadvantage of bringing about a better mixing can be combated by using higher velocities of the liquid phase and by longer paths for the fluid. A discussion of column dimensioning and of calculating the plate number is given.

25603 **APTIC NO. 47109**

Blossom, John S. and Donald R. Bahnfleth

STUDY POLLUTION CONTROL, FUEL AVAILABILTY FOR INDUSTRIAL BOILER PLANTS. *Heating, Piping, Air Conditioning, 44(11):78-85, Oct. 1972. 1 ref.*

Air pollution control and fuel availability, along with the more traditional engineering concerns of performance and economy, were analyzed in a comprehensive study of modifications for two industrial steam generating plants. An evaluation was made of state and local air pollution regulations applicable to the two systems. The price and availability of fuels, both present and future, were evaluated, in addition to systems for burning each fuel in compliance with air pollution regulations. Data on existing plant operation were obtained from the plant engineering staff to form the basis of operating and maintenance cost analyses. Visible emission limitations, particulate, sulfur oxide, nitrogen oxide, carbon monoxide, and

photochemical oxidant emission limitations are discussed. The fuels studied included natural gas and its substitutes, low sulfur bituminous coal, distillate fuel oil (No. 2 heating oil), and No. 5 fuel oil with low sulfur content. Future trends in prices are estimated for the different fuels. A flow diagram is presented for air pollution control with coal and oil burning boilers. Particulate removal, sulfur oxide control, and oxides of nitrogen control are considered for coal, as well as opacity control. Burning oil to meet standards is also discussed. Control systems include process modifications, collectors, fuel oil desulfurization, removal of sulfur dioxide with scrubbers, low excess air control of NOx, and scrubbers.

25604 **APTIC NO. 47222**

Bowditch, Fred W.

THE AUTOMOBILE AND AIR POLLUTION - WHERE DO WE GO NEXT? Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 357-373. (Oct. 17-19.)

Sources of air pollution from the automobile include the crankcase ventilation system, exhaust system, fuel tank vent, and the carburetor float bowl. The amount of carbon monoxide, oxides of nitrogen, and hydrocarbons emitted from the various sources is indicated, as well as the various emission control hardware which is being utilized. Federal and California exhaust control requirements are compared for 1975 and 1976. Alternate sources of power to substitute for the gasoline engine are also mentioned, in addition to propane or natural gas. At the moment, however, added control to the present gasoline engine appears to be the most optimistic approach to meeting 1975-1976 requirements. The heart of the system which is being developed at General Motors is the catalytic reduction and oxidation subsystem included in the exhaust.

25605 **APTIC NO. 47110**

Edgar, Wm. D.

COKE-OVEN AIR EMISSIONS ABATEMENT. *Iron Steel Engr., 49(10):86-94, Oct. 1972. 7 refs.*

Sources of coke-oven emissions, types of emissions and controls, pipeline charging of preheated coals to coke ovens, oven pushing, and coke quenching are considered. Gas scrubbers, incinerators, exhaust systems, and various collection system requirements are indicated. In addition to the reduction or elimination of coke-oven emissions, some plants are improving the operator s environment, either by providing better working conditions or by eliminating certain operating jobs. Perhaps the worst environment is encountered by the lidman on top of the battery, and current laws require the use of respirators by all top-side personnel. While the systems or modifications of systems as described will be adaptable to most plants, other operators are looking toward other processes, such as form-coke or direct reduction, which will eliminate the need for by-product coke ovens and, in the latter case, blast furnaces.

25606 **APTIC NO. 47185**

Egger, H.

UNICEM S NEW GUIDONIA PLANT NEAR ROME, ITALY. *Pit Quarry, 65(2):94-101, Aug. 1972.*

A new 1.65 million short-ton, dry-process cement plant to be located at Guidonia, Italy is described. Clinker is stored in three concrete silos and is discharged by gravity without any dust emission. Electrostatic precipitators are provided for the kiln and cement mill installations; gravel bed filters for the clinker cooler exhaust air; and bag-type filters for the crushing plant, packhouse, pozzolan drying, and auxiliary equipment. The gravel bed-type filter is particularly well suited for the clinker cooler exhaust, and is simple, requires little maintenance, and is very efficient. With proper application of the dust collection equipment, the plant is dust-free. The plant is also unique in its automation and the three 6000-kW gearless drives for the raw finish mill and two cement mills. Product control was developed in the quarry, prehomo, raw grinding, and cement grinding processes.

25607 **APTIC NO. 47161**

Fukumoto, Tsutomu

COMPOSITION AND TREATMENT OF FLUE GAS FROM THE COMBUSTION OF PLASTIC WASTES - DEHALOGENATION, DESULFURIZATION, AND DENITRATION. *(Purasuchikku haikibutsu shokyaku haigasu no sosei to shori - datsuen, datsuryu oyobi datsusho). Text in Japanese. Kagaku Kojo (Chem. Factory), 16(7):15-23, July 1972. 32 refs.*

Combustion gases of various plastics are analyzed and the treatment methods are discussed chemically and mathematically. One method of eliminating various toxic matters such as hydrogen chloride, nitrogen oxides, hydrogen cyanide, sulfur dioxide, sulfuric acid simultaneously is by a scrubber. In selecting a scrubber type, its gas capacity, pressure loss, liquid-gas ratio, performance, stability in relation to gas quantity fluctuation, scaling, anti-corrosiveness, structure, maintenance, construction cost, and operation cost must be examined. A turbid type scrubber such as the venturi scrubber or a porous-type tower such as Raschig Tower is desirable. Using a Raschig Tower, absorption experiments for HCl and SO2 have been conducted. The absorption rate for HCl by water was higher than the absorption rate for SO2. Water, alkaline, solutions of ferrous sulfate, or an oxidizing agent is used for NOx absorption, but in any case, the rate is low. The reduction methods using ammonia, and activated carbon are discussed, and NOX adsorption using silica gel is presented.

25608 **APTIC NO. 47115**

Fushimi, Hiroshi

REMOVAL OF METAL COMPONENTS AS IMPURITIES IN CRUDE OIL. REPORT NO. 2. *(Genyu-chu ni fukumareru fujun kinzoku seibun nado no jokyo ni kansuru kenkyu (dai ni-ho). Text in Japanese. Japan Petroleum Inst., Tokyo, Proc. Symp. Japan Petroleum Inst., 15th, 1972, p. 13-16. (July 10-11.)*

Experiments were conducted for removal of impure metals in crude oil in order to prevent air pollution by these metals after the combustion of fuel oil. The purposes of the experiments were to find a quick method of extracting metals using a moderate temperature, a low pressure, and economical chemicals. Extraction rates were examined. Vanadium and iron extraction rates were improved. The nitric acid extraction rate and the hydrogen chloride extraction rate were improved over those of TBP.

25609 **APTIC NO. 47105**

Garrett, Ken

WANKEL ENGINE HERE TO STAY. *Engineering (London), 212(9):852-853, Sept. 1972.*

Seal development, lubrication, cooling, and the ignition system for the Wankel engine are discussed. Contrary to rumors, the Wankel engine exhaust is relatively easy to clean. Admittedly, its hydrocarbon content is higher than that of conventional engines, but this is offset by the fact that the exhaust gas temperature is about 150 C higher than most. Because of this high temperature, afterburning is easy to effect. The output of carbon monoxide, again cleaned by afterburning, is about the same as that of a conventional engine. Owing to the relatively low rate of pressure rise and longer power stroke, peak temperatures in the combustion chamber are low so the output of oxides of nitrogen is very low indeed, and the engine will run on unleaded fuel of low octane rating.

25610 **APTIC NO. 47233**

Hakala, N. V., W. Bartok, and C. W. Siegmund

CONTROL OF NOX EMISSIONS FROM STATIONARY COMBUSTION. *Union of Japanese Scientists and En-*

gineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 263o279. 19 refs. (Oct. 17-19.)

Studies on the combustion of residual fuel oil in a small package boiler determined the contributions of fuel nitrogen conversion and thermal fixation of nitrogen to nitrogen oxides emissions as well as the influence of combustion modification techniques on NOx formation. Cooled flue gas recirculation mixed with the combustion air was effective in reducing thermal NOx but did not influence the NOx from fuel nitrogen substantially. At high recirculation rates, it was possible to reduce the thermal NOx contribution to near zero. Conversion of fuel nitrogen to NOx was primarily a function of the fixed nitrogen concentration in the fuel. The excess air level varied the conversion to a minor extent. Two-stage combustion gave marked reductions in both thermal NOx and fuel NOx. A systematic field study was conducted to assess the application of combustion modification techniques to the control of NOx emissions from gas, oil, and coal-fired utility boilers, in cooperation with participating boiler operators. Major combustion operating variables included low excess air firing, staged combustion, fuel gas recirculation, burner tilt, primary/secondary air ratio, and air preheat temperature, at various load levels. The most effective combustion modification was staged firing with low excess air. Flue gas recirculation was also effective where gases were recirculated into the flame zone.

25611 **APTIC NO. 47119**

Hosaka, Rikizo

RECOMBUSTION APPARATUS. *(Sainen kanshoki). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-41487. 3p., Oct. 20, 1972. (Appl. Dec. 5, 1970, 1 claim).*

In the back of the primary combustion chamber is a recombustion chamber which consists of small tubes alternately arranged with tubes of salts. This is a device to divide combustion gas into small portions; by supplying secondary air to each portion, complete combustion is achieved. The salts packed in the alternate tubes are sodium nitrate or potassium chloride, which retain heat and help complete combustion. When the temperature of combustion gas is low, the salts may be heated by an additional burner to approximately 700 C, or cooled if the temperature is too high.

25612 **APTIC NO. 47162**

Iida, Hirofumi

THE RECENT TREND OF HEATING FURNACE TECHNOLOGY. *(Saikin no kanetsuro no gijutsuteki doko). Text in Japanese. Kinzoku (Metal) (Tokyo), 42(13):129-140, July 1972.*

Oil and gas as fuel are compared. According to published data, gas is far superior to fuel oil in the amount of sulfur dioxide emission, aldehydes, carbon monoxide, hydrocarbons, nitrogen oxides, soot, and other particles from the standpoint of prevention of air pollution. The recent trend therefore is a serious consideration for gas as an industrial fuel. High speed burners are also drawing much attention. The characteristics of a high speed burner, its use, applicability, and examples of applications are discussed. Billet heating, strip heating, and aluminum melting are some of the jet burner application examples. Its strong stirring force can be applied to box type furnaces, cylindrical furnace, and continuous furnaces.

25613 **APTIC NO. 47240**

Iinoya, Koichi

FUNDAMENTAL RESEARCH WORK IN JAPAN ON DUST COLLECTORS. *(Shujin sochi ni kansuru kiso kenkyu). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 233-250. 72 refs. (Oct. 17-19.)*

Research conducted in Japanese institutes on the fundamentals of dust collectors is reviewed. The cyclone has been shown not to have a high enough efficiency for source control to prevent air pollution. With regard to the cyclone, there are still unsolved problems, such as how to estimate its performance from its dimensions and operating conditions. From both the analytical and experimental point of view, study of the air filter may be the most advanced in the field of dust collectors. The fibrous filter has been studied with and without electrostatic forces. The bag filter, which is difficult to study theoretically, is now being examined to estimate its time dependent performance and filter medium life. Not much research has yet been performed on scrubbers and the electrostatic precipitator.

25614 **APTIC NO. 47128**

Ishibashi, Takeya

THE OPERATION RESULTS OF FLUE GAS DESULFURIZATION APPARATUS USING SODIUM SULFITE. *(Aryusan soda-ho ni yoru haien datsuryu sochi no unten jisseki ni tsuite). Text in Japanese. Association for the Prevention of Industrial Public Nuisance (Japan), Proc. Assoc. Prev. Ind. Pub. Nuisance, Symp., 2nd, Japan, 1972, p. 29-33. (Oct. 3-7.)*

The sodium sulfite stack gas desulfurization system in operation at an electric power plant is discussed. The features of this system are that stable, continuous operation is possible; maintenance is easy; a large capacity of stack gas can be treated; the construction cost, space requirement, and operation staff requirement are all small; the waste from the process is minimal; the marketability of the recovered by-product is high, and its handling is easy. The process uses sodium sulfite as an absorbent for sulfur dioxide in the stack gas. Sodium sulfite is recovered by a caustic soda medium. The system consists of a scrubber, the primary adjustment tank for pH and temperature of absorbent, a liquid refining tank which eliminates dusts and impurities and refines sodium sulfite, and a white smoke control system. The SO2 elimination rate of the system as a whole is approximately 80% because a portion of untreated stack gas is mixed for prevention of white smoke; but the scrubber itself eliminates SO2 at a rate between 90 to 95%.

25615 **APTIC NO. 47127**

Kagiyama, Ichiro

THE NEW ROLE OF LNG. *(LNG no atarashii yakuwari). Text in Japanese. Association for the Prevention of Industrial Public Nuisance (Japan), Proc. Assoc. Prev. Ind. Pub. Nuisance, Symp., 2nd, Japan, 1972, p. 7-13. (Oct. 3-7.)*

The history of liquid natural gas as a fuel is briefly discussed, and the storage and production quantities of LNG in the world, sample compositions of LNG and natural gas, and physical properties of LNG are presented in tables. According to the projected figures of potential LNG supplies and sources in the world to Japan, the major suppliers will be Iran, followed by Canada.

25616 **APTIC NO. 47247**

Kobayakawa, Takashi

TECHNOLOGY TO CONTROL AUTOMOBILE EXHAUST EMISSION AND THEIR EFFECTIVENESS TO DATE IN JAPAN. *(Nihon ni okeru jidosha haishutsu gasu taisaku gijutsu). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 325-344. 6 refs. (Oct. 17-19.)*

Automobile emission control methods in use in Japan and their effectiveness to date are discussed, in addition to anticipated developments with regard to emission control technology. In Japan, the emphasis is placed on the reduction of carbon monoxide in engine exhaust emissions since the environmental standards for CO are already established. The control technology to meet the required CO value includes engine modification, carburetor improvements, adjustment of air in-

take, installation of an idle control device, and other additions. Surveillance data collected at the National Monitoring Stations in Tokyo and Osaka reveal that CO concentrations reached a peak in 1969 and have been decreasing since then. Hydrocarbon emissions have been reduced by some 20-25% with a blowby gas recirculation device, while another 20-30% HC has been reduced along with CO. Devices still need to be developed to meet the 1975 oxides of nitrogen requiremtnts. Devices such as the catalytic converter, thermal reactor, afterburner, and exhaust gas recirculation have been used to reduce NOx.

25617 **APTIC NO. 47108**

Kringstad, Knut P., William T. McKean, Jan Libert, Peder J. Kleppe, and Cheu Laishong

ODOR REDUCTION BY IN-DIGESTER OXIDATION OF KRAFT BLACK LIQUOR WITH OXYGEN. *TAPPI, 55(10):1528-1533, Oct. 1972. 16 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Alkaline Pulping Conference, 25th, Houston, Tex., Oct. 25-28, 1971.)*

Laboratory studies showed that sodium sulfide was rapidly oxidized to thiosulfate by the injection of oxygen into the digester at the end of a kraft cook. About 4.5% oxygen on pulp, corresponding to two moles of oxygen per mole of sodium sulfide was required to reduce the sodium sulfide content in the black liquor by 90% under the conditions used. Proportionately larger amounts of oxygen achieved higher degrees of sodium sulfide oxidation. The injection of oxygen also reduced the content of methyl mercaptan in the liquor by more than 99%, and in all tests dimethyl disulfide was reduced to an almost undetectable amount. The content of dimethyl sulfide was not influenced to any noticeable degree. The oxygen injection did not influence the pulp yield or the strength properties of the pulp. However, the pulp was somewhat easier to beat and had a slightly lower brightness. (Author abstract)

25618 **APTIC NO. 47167**

Kunibe, Susumu

THE PROCESS FOR REMOVAL AND DEODORIZATION OF SPECIFIC ELEMENTS IN FLUE GAS BY ADSORPTION. *(Haigasu-chu no tokutei seibun no kyuchaku ni yoru jokyo oyobi dasshu purosesu ni tsuite). Text in Japanese. Association for the Prevention of Industrial Public Nuisance (Japan), Proc. Assoc. Prev. Ind. Pub. Nuisance, Symp., 2nd, Japan, 1972, p. 19-24. (Oct. 3-7.)*

The general principles of an adsorption system for bad odor elements are explained by flow charts. The circulation heat recovery method can be applied to elimination of specific odor elements from various kinds of fluids and for refining and separation of many kinds of materials. The solution recovery process system, also shown by a flow sheet, can be applied to acetone, benzene, xylene, or hexane. Adsorption agent is often activated carbon, which is recovered and renovated outside the system, and after supplying a portion of new material, it is replaced in the packed tower.

25619 **APTIC NO. 47280**

Kuno, Koichi and Shuji Hirayama

AMMOXIDATION OF TOLUENE BY OXYGEN IN CATALYST. *(Shokubai sanso ni yoru toruen no ammo sanka). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 11:2034-2040, 1972. 25 refs.*

Oxidation of toluene to benzonitrile by the pulse reaction method was studied. Ammonia adsorbed on a 10% vanadium pentoxide titanium dioxide catalyst was quickly oxidized to nitrogen and water at 375 C. At the same time V205 in the catalyst was apparently reduced. Adsorbed toluene was oxidized by the oxygen in the catalyst to toluene dimer, benzaldehyde, benzoic acid, carbon dioxide, and benzonitrile precursor, which was converted to benzonitrile by ammonia pulse. Stability of the precursor was investigated at 350, 375, and 400 C; adsorption and oxidation of benzonitrile was negligible in these experiments. The difference of selectivity for benzonitrile formation between a continuous flow system and the pulse reaction one is discussed.

25620 **APTIC NO. 47253**

Kuronuma, Haruo, Hiromitsu Kojima, and Raisaku Kiyoura

CATALYTIC OXIDATION OF LOW CONCENTRATION SO2 OVER V2O5-K5SO4 CATALYST. *(Banajiumu kei shokubai ni yoru teinodo nisanka io no sanka hanno). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc., Japan), no. 10:1847-1853, Oct. 1972. 20 refs.*

The mechanism of catalytic oxidation of sulfur dioxide over a vanadium-potassium catalyst was investigated at the lower SO2 concentrations. The initial oxidation rate was measured at a reaction temperature of 400-500 C, an SO2 concentration of 0.1-1.5%, and an oxygen concentration of 0.4-5%. The reaction rate was not affected by diffusion rate. The rate of oxidation increased with increasing partial pressure of oxygen up to a certain value and then decreased. The position of the peak in the curve of oxidation rate versus the partial pressure of SO2 was not influenced by the partial pressure of oxygen but changed with reaction temperature. The overall reaction rate was controlled by the reaction between the adsorbed SO2 and oxygen on the catalyst.

25621 **APTIC NO. 47239**

Kurosawa, Keiji

FLUE GAS DESULFURIZATION BY WELLMAN-LORD PROCESS. *(Weruman-rodo- ho ni yoru haien datsuryu). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 225-232. (Oct. 17-19.)*

The Wellman-Lord process utilizes a caustic soda wash to absorb sulfur dioxide from flue gases, and as a recovery process, its soda consumption is lower than the various throw-away processes. Together with up-to-date engineering techniques, the Wellman-Lord process takes advantage of the difference of the solubilities in water of the two sulfur compounds, sodium sulfite and sodium hydrogen sulfite. A modified form of the Wellman-Lord process is described.

25622 **APTIC NO. 47294**

Meguerian, G. H., F. W. Rakowsky, E. H. Hirschberg, C. R. Lang, and D. N. Schock

NOX REDUCTION CATALYSTS FOR VEHICLE EMISSION CONTROL. *SAE (Soc. Automot. Engrs.) Spec. Pub., no. 370, 24p., May 1972. 9 refs. (Presented at the Society of Automotive Engineers, National Automobile Engineering Meeting, Detroit, Mich., May 22-26, 1972 and American Petroleum Institute, Refining Division Meeting, New York, May 8-11, 1972, Paper 720480.)*

The Inter-Industry Emission Control program to develop nitrogen oxide catalysts with improved durability is discussed. Nickel oxide catalysts were tested on pelleted, monolithic ceramic, and metallic supports. The pelleted, promoted nickel oxide NOx catalysts had very high activity at temperatures as low as 700 F at mildly reducing (0.8-1.5% carbon monoxide) conditions, minimized ammonia formation, and resisted mechanical and thermocycling attrition, but were strongly deactivated by sulfur in the feed gas. However, these catalysts were very sensitive to thermal degradation at temperatures above 1400 F, and even at 1300 F they degraded with prolonged use. Because of this limitation, coupled with their deactivation even with 0.005 wt% sulfur in the fuel at temperatures below 1100 F, practical usefulness of pelleted NOx catalysts may be seriously limited. Monolithic and metallic catalysts were not active at temperatures below 1000 F, but were very active at higher temperatures where deactivation by sulfur and ammonia formation are not troublesome. Nevertheless, these

catalysts must be warmed up very quickly to temperatures of 1200 F and above during the CVS cold start test and must prove durable at temperatures as high as 1800-2000 F during vehicle operation. (Author summary modified)

25623 **APTIC NO. 47156**

Miuchi, Shigeru, Masaaki Mitarai, and Takao Suzuki

CATALYTIC CARRIER FOR HYDRODESULFURIZATION. *(Suisoka datsuryu shokubaiyo tantai). Text in Japanese. (Sumitomo Metal Mining Co., Ltd., Tokyo (Japan) Japan. Pat. Sho 47-35666. 8p., Sept. 7, 1972. (Appl. Oct. 9, 1968, 1 claim).*

Alumina catalytic carriers are often used for desulfurization of fuel oil containing mercaptan, thiophene, and other sulfur compounds. Examination of various alumina X-ray refraction types lead to a discovery that the form of the refraction graphic line of 400 and 440 phases (especially the latter) and the performance capacity of the catalyst using an alumina carrier had a close relationship. The type of alumina carrier, of which X-ray refraction index would form a graphic representation of a mountain type with a long base in relation to the peak of maximum intensity, seemed to be most suitable for desulfurization of hydrocarbons. Based on this discovery, an alumina hydrate was obtained by the hydrolysis of aluminum alcoxyde and by baking it at 400 to 700 C.

25624 **APTIC NO. 47290**

Nagata, Katsuya

NITROGEN OXIDES EMISSION FROM STATIONARY COMBUSTION PROCESSES AND ITS CONTROL TECHNIQUES - CONTROL OF NOX IN BOILER FLUE GASES BY THE TWO STAGE-FLUE GAS RECIRCULATION METHOD. *(Nensho sochi ni okeru chisso sankabutsu no hassei to yokusei taisaku--boila ni okeru hassei jokyo to haigasu junkan nensho ni yoru yokuseiho). Text in Japanese. Nihon Kikai Gakkai-shi (Journal of the Japanese Society of Mechanical Engineers (Tokyo)), 75(643):1293- 1300, Aug. 1972. 5 refs.*

Nitrogen oxides in the boiler combustion gas were examined chemically and mathematically, and experiments were conducted using a two-stage combustion boiler to see the characteristics of nitrogen oxides formation. Variable experiments were made with changing conditions of combustion, recirculating or not recirculating the combustion gas for the air supply in the first stage combustion, or using or not using the recombustion chamber. A relatively small boiler used by factories emits approximately 2-7 kg of NOx/ton of fuel oil; the higher the combustion temperature, the more NOx is emitted. The emission of NOx from a boiler combustion is rather low compared to emission at the specific combustion temperature. The reaction speed seems to play an important part in NOx emission. By recirculating the combustion gas, NOx can be reduced considerably. The location of the secondary combustion has an important effect on the amount of NOx, and sometimes NOx can increase because of the secondary combustion.

25625 **APTIC NO. 47282**

Nakao, Yoshinobu, Ai Nakai, and Hiroshi Nakaya

METHOD TO PREVENT ADHESION OF COLLECTED GASEOUS-PHASE DUST. *(Kisoo shujin dasuto no fuchaku boshiho). Text in Japanese. (Nakao Firuta Kogyo K. K. Japan)) Japan. Pat. Sho 47-44908. 6p., Nov. 13, 1972. (Appl. Dec. 22, 1970, 3 claims).*

With the conventional gaseous-phase dust collection method using a filter cloth, the problem is that dust removed by the filter cloth adheres to the filter cloth surface and eventually forms a dust cake. Unless the dust cake is removed from the filter cloth, usually every 30 minutes or so and in some extreme cases every few minutes, the pressure loss is so great that dust-collecting operation is no longer possible. Under this invention, the AC electric field formed on the dust collecting surface of the filter cloth or that formed close to the filter prevents dust from adhering to the filter cloth and subsequently forming dust cake. With this new method, it seems that dust arrested by the electric or magnetic field grows into a larger particle through its contact with other dust particulates suspended in the field, thus falling down as a large-size dust. But the same does not develop in a DC electric field. A coated wire was wound spirally on a filter bag, one bag with 2 cm of space between windings and the other bag with 1 cm space. The former was applied AC 10000 V while the latter was applied AC 15000 V. Their performances were compared with that of another filter bag without any AC electric field device. With the 10000 V filter bag, dust accumulated in 50 min of continuous operation was even less than that accumulated on the no-electric field bag in 30 min. With the 15000 V bag, the result was even better than the 10000 V bag.

25626 **APTIC NO. 47251**

Ohno, Chotaro

IMPROVEMENT IN EFFICIENCY OF DUST COLLECTOR ON FLY ASH FROM PULVERIZED COAL FIRED BOILERS. *(Bifuntan boira haigasuyo shujin sochi no seino kojo). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 281-290. (Oct. 17-19.)*

The capacity of pulverized coal fired boilers in Japan has increased since about 1958, and combustion efficiency has been substantially improved. Consequently, the dust collecting requirements of electrical precipitation have been decreasing. Some modifications of the electrical precipitator for the effective treatment of dust with a high electrical resistivity are described, as well as a field test to evaluate the new modifications. Field tests were also done using heavy oil.

25627 **APTIC NO. 47260**

Onizuka, Shigenori and Jinshiro Fujita

ADSORPTION TOWER. *(Kyuchakuto). Text in Japanese. (Hitachi Shipbuilding and Engineering Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 47-46264. 4p., Nov. 21, 1972. (Appl. July 23, 1970, 1 claim).*

This is an improved version of a cross-flow adsorption tower in which pelletized adsorbent is held between the baffle plates features a unique angular arrangement of the baffle plates of the intake side. Connected to the top side of the tower is a hopper containing the absorbent pellets. The left side of the tower is the intake side where a number of baffle plates are installed above one another, each slanting at an identical angle from the vertical. It is arranged so that the angle formed by a hypothetical line drawn between the two nearest ends of the two neighboring baffle plates against the horizontal line may be smaller than that formed by the surface line of the pellets held between the two baffle plates against the horizontal line. Therefore, some of the absorbent pellets or grains falling onto the baffle plates spill over the plates into the intake gas dispersion duct, even when the layers of the adsorbent formed between the plates are moving. When the gas which contains tar and dust is taken in, the tar and dust are adsorbed by the adsorbent pellets that spill over the plates, thereby preventing the dust and tar from accumulating in the pellets held between the plates. This keeps the gas flowing through the adsorbent pellets smoothly.

25628 **APTIC NO. 47210**

Onuscheck, J. W. and R. L. W. Holmes

OXYGEN AND OIL IN A BOF. *J. Metals, 24(9):26-36, Sept. 1972.*

To increase hot metal producing capacity, in-vessel preheating of scrap prior to charging hot metal was employed to permit utilization of scrap in the place of hot metal. A basic oxygen furnace was developed to burn No. 6 fuel oil. Operating varia-

bles, the calculation of furnace practice with computer, and yields are discussed. The oil preheat reduced the slag iron oxide content, lowered turndown carbon values, gave higher steel sulfurs, and reduced lining life. Another important advantage of the oxy-fuel process was a 30% reduction in the waste gas dust load. The size and shape of the dust particles were changed from those generated by the normal practice and were 10 times larger than normal. With larger and fewer particles, gas cleaning can be improved. The BOF shop production can be increased 10-15% with oxygen-fuel preheating because of reduced hot metal needs in cases where the hot metal supply is limited.

25629 **APTIC NO. 47118**

Otsuna, Nobuo

APPARATUS FOR FLUE GAS PURIFICATION. *(Haien joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-41486. 3p., Oct. 20, 1972. (Appl. Dec. 31, 1970, 1 claim).*

The apparatus consists of an outer case into which flue gas is sent in through a pipe by a fan; by a semicircular guiding wall, the gas circulates and encounters the forceful flame from a supplementary burner. Incompletely burned material is burned and the friction of the force of the flame and the reversely moving air current crush the ashes into smaller particles. The combustion gas is then pushed toward the water tank which is installed in the middle of the apparatus. The steam from the tank (water vaporized by the burner below) adsorbs dusts and ashes, and the gas collide into the baffleboard protruding at an angle from the ceiling of the apparatus. Dusts and ashes precipitate in the water tank and the clean air is discharged from the exhaust pipe above.

25630 **APTIC NO. 47186**

Panesko, J. Vincent

HYDROFLUORIC ACID SCRUBBER SYSTEMS. *Atlantic Richfield Hanford Co., Richland, Wash., Chemical Processing Div., Atomic Energy Commission Contract AT(45-1)2130, Rept. ARH2343, UC-4, TID-4500, 11p., June 1972. 4 refs.*

NTIS: ARH-2343

Caustic or aluminum scrubber solutions were tested to remove hydrogen fluoride vapors from waste off-gas streams. The efficiency of the tested solutions was greater than 99%. Two potential problem areas were observed: rapid HF addition rates could increase the temperature of potassium hydroxide to near boiling; and solids appeared in aluminum scrubber solutions when the fluoride: aluminum molar ratio exceeded 1.6. When the aluminum scrubber solutions were heated, a fluoride:aluminum molar ratio of 5.8 could be achieved with no solids formation. (Author summary modified)

25631 **APTIC NO. 47145**

Rabb, A. and R. Rossbach

SELECTION OF GAS- AND STEAM TURBINES FOR THE ENERGY CIRCUIT OF CHEMICAL PLANT. *(Die Auswahl von Gas- und Dampfturbinen fuer den Energiekreislauf chemischer Anlagen). Text in German. Chem.-Ing.-Tech., 44(8):527-530, April 1972.*

In chemical industrial installations where, apart from electric power, the two major types of energy required are compressed air and steam, a central power station incorporating a gas turbine, a steam turbine, a prime steam generator, and a waste gas heated steam boiler forming an integrated system, is the most economical system. In one example, the gas and steam turbines drive the air compressor, the 15 atm steam supply required for chemical processing is tapped off the steam turbine, the waste gas for heating the steam boiler is obtained from the exhaust of the gas turbine. An energy system used for a biological clearing installation for waste water was designed with a view to avoiding air and water pollution. A gas turbine drives an electric generator. The air compressor for the gas turbine is tapped to furnish the air required to supply the clearing basin with oxygen. The exhaust gases from the gas turbine are utilized for drying the sludge in a special dryer and to act as pre-heated combustion air in the sludge incinerator.

25632 **APTIC NO. 47184**

Salooja, K. C.

BURNER FUEL ADDITIVES. *J. Inst. Fuel, 15(371):37-42, Jan. 1972. 41 refs. (Presented at the International Flame Research Foundation, Flame Chemistry Panel Meeting, Sept. 1970.)*

Burner fuel additives can control combustion-related problems such as smoke emission, high-temperature corrosion caused by metal impurities in fuel, and low-temperature corrosion and acid-laden smut from sulfur in fuels. Additives can be used with aviation fuels, heating oils, gas oils, and residual fuels. Smoke suppressants can also reduce the other problems indirectly because of the reduction in excess air and subsequent reduction in sulfur trioxide formation. By reducing excess air, suppressants also reduce nitrogen oxides. Some additives are described, performance data are given, and basic research contributions to the mechanism of action are discussed. (Author abstract modified)

25633 **APTIC NO. 47116**

Sanada, Yukio

STACK GAS EXHAUSTION METHOD BY UTILIZING BALLOON. *(Kikyo o riyo shita entotsu no haiki hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 47-41485. 3p., Oct. 20, 1972. (Appl. Nov. 20, 1970, 1 claim).*

This is an easy and inexpensive way of extending stacks to the regulation stack height required by law. A supplementary stack made of a flexible, light, heat resistant material is suspended by a balloon above the ordinary stack. The supplementary stack may be made of one section, or several sections connected with hooks. In order to maintain the cylindrical shape of a stack, at least both ends of the stack length of each section should have metal rings sustaining the shape. The balloon is attached to the top section of the flexible stack, but it is also operated by a cord through guide rings outside the supplementary stacks. The cord reaches the ground where the height can be adjusted. The supplementary stack is opened and hoisted by the balloon, and then the lower end reaches the upper end of the regular stack, the balloon is stopped and is anchored by the cord at a stationary position. When there is a strong wind, the balloon and the supplementary stack can be taken down.

25634 **APTIC NO. 47123**

Shindo, Hirofumi and Toshio Shibahara

CLOGGING INDICATOR FOR AIR CLEANER FILTER. *(Kuki senjoki no firuta no mezumari hyoji sochi). Text in Japanese. (Matsushita Seiko K. K. (Japan)) Japan. Pat. Sho 47-39537. 2p., Oct. 5, 1972. (Appl. Sept. 17, 1969, 1 claim).*

A fan can be installed on a rotor of a motor, in the space between the motor and the filter of an air cleaner. At the end of the rotation shaft is a piezoelectric element which reacts to the changes of electric resistance. The element and a warning system are connected with the power source on the same circuit. When the filter is clogged and air does not come in easily, the air in the cleaner is rarefied and the fan load decreases. This causes the fan to rotate faster and the magnetic suction between the rotor and the starter is intensified. The pressure change is felt by the piezoelectric element on the rotation shaft and the warning lamp lights up.

25635 APTIC NO. 47250

Shiozawa, Kiyoshige, Keiji Kurosawa, Takehiro Takahashi, and Jiro Murakami

PREVENTIVE TECHNOLOGY SYSTEM OF SMOG FROM STATIONARY SOURCES. *(Nensho haien boshi shisutemu). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 291-309. 11 refs. (Oct. 17-19.)*

Various desulfurization methods are examined from the standpoint of costs. The combination of the direct desulfurization method with stack gas desulfurization is especially expensive and the available power output is extremely small. Other methods such as the combination of indirect desulfurization plus residual oil treatment plus stack gas desulfurization, or the use of distillate plus residual oil plus stack gas desulfurization, or the use of distillate plus combo-Flexicoker and indirect desulfurization yield about the same result and cost. The future goals for securing low sulfur content in the air and the supply method for the fuel are discussed. Nitrogen oxides in combustion gases are chemically and mathematically examined. As a simultaneous solution for controlling both SOx and NOx content in combustion gases, the combined use of a distillate boiler and a high sulfur content residue boiler is suggested. The stack gas from the residue boiler should be treated by the wet method stack gas desulfurization and an electrostatic precipitator; the treated gas should be mingled with the gas from the distillate boiler and emitted from the stacks. This method should solve the question of both NOx and SOx content in the stack gas with a relatively high dispersion rate, and the cost problem should be also satisfactory.

25636 APTIC NO. 47243

Simpson, Bruce H.

AUTOMOTIVE EMISSIONS CONTROL IN THE UNITED STATES. *Union of Japanese Scientists and Engineers, Pro. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 345-355. 13 refs. (Oct. 17-19.)*

The motor vehicle s contribution to total air pollution, reduction in vehicle emissions, possible future emission control methods, effects of lead, and alternate power plants are discussed. Automotive power plants for the balance of this decade will be highly refined derivatives of today s internal combustion engines. Exhaust gas recirculation, baffles, thermal reactors, and catalytic converter systems are being developed to meet future requirements, although both customer acceptance factors and emission control are not fully acceptable at this time.

25637 APTIC NO. 47293

Snyder, P. W., W. A. Stover, and H. G. Lassen

STATUS REPORT ON HC/CO OXIDATION CATALYSTS FOR EXHAUST EMISSION CONTROL. *SAE (Soc. Automot. Engrs.) Spec. Pub., no. 370, 22p., May 1972. 15 refs. (Presented at the Society of Automotive Engineering, National Automobile Engineering Meeting, Detroit, Mich., May 22-26, 1972, and the American Petroleum Institute, Refining Division Meeting, New York, May 8-11, 1972, Paper 720479.)*

The 1975 Federal CVS test procedure has affected the catalyst requirements for satisfactory emissions control because it places a heavy emphasis on minimizing the time required after engine start-up to begin converting exhaust emissions. The inter- industry emission control program has studied and developed catalysts with low ignition temperature and/or low mass. Catalyst ignition time in hydrocarbon/carbon monoxide converters can be improved by low thermal capacity monolithic catalyst supports, by locating the converter after the thermal reactor and/or closer to the exhaust manifold, by developing catalysts with superior stability to long exposure at high temperatures, and by developing catalysts with improved low temperature activity. Small laboratory samples of potential HC/CO oxidation catalysts were screened for activity in a laboratory-simulated cold-start test with exhaust from a two-cylinder engine. Several improved catalysts were evaluated in a full-size converter cold-start test with exhaust from a 351 cu in. engine. The inhibiting effect of CO and nitric oxide on the oxidation of CO, the effect of oxygen on temperature required for 50% conversion of CO, and the effect of NO on cold start activity of low ignition temperature catalysts were studied. Locating the converters closer to the exhaust manifold resulted in higher catalyst operating temperatures which require greater stability at high temperatures in the presence of trace contaminants. Stability when exposed to wide temperature variations and changes from oxidation to reduction environments were evaluated in a thermal-cycling test for several improved catalysts. Stability to long-term exposure was evaluated in an engine dynamometer mileage accumulation test under simulated road conditions. The rapid thermal-chemical response of the improved catalyst, operated closer to the exhaust manifold, increases the occurrence of excessive catalyst temperatures. Math model studies of the effect of the improved catalyst properties on thermal response indicated a need to prevent high CO or HC concentration peaks in the engine exhaust or to improve properties of existing catalysts. System changes, such as moving the low-temperature catalyst farther from the exhaust manifold, may be required to obtain some protection from catalyst overtemperatures. These changes increase emission levels and require a breakthrough in engine control of raw emissions or improved catalysts. (Author abstract modified)

25638 APTIC NO. 47151

Sterling, W. K.

MAINTENANCE OF CLEAN AIR AT THE WORKING PLACE. *(Reinhaltung der Luft am Arbeitsplatz). Text in German. Technica, 21(22):2030-2032, 1972.*

For the separation of fine dusts, hydrogen chloride, sulfur dioxide, and ammonium chloride, a wet scrubber with a disintegrator can be used. The scrubber is of a cylindrical design and accommodate a ventilator, dust collector, and water and sludge container. Another version of this scrubber has an additional venturi stage. For the separation of oil vapors and mists, two versions of separators are available. They have a cylindrical shape with a cyclone-shaped bottom section. One unit accommodates a ventilator, a preliminary separator, fine filter, and oil trough. The polluted air first enters into the cyclone-shaped bottom where the coarse particles are separated. In the fine filter the finest particles are separated by the labyrinth-effect of the filter. The separated oil collects in the oil sump. The second version can be directly installed at the machine which produces the oil mists. It consists of a drum which rotates with about 2850 rpm/min. The polluted air is drawn-in and starts to rotate so that the fine droplets impact, grow, and are thrown towards the wall. A smaller filter is available particularly for the separation of synthetic dusts.

25639 APTIC NO. 47122

Tamaki, Akiyoshi, Hideo Idemura, and Toshio Kanai

DEVELOPMENT OF DESULFURIZATION APPARATUS FOR FLUE GASES - ITS HISTORY AND OUTLINE. *(Haien datsuryu sochi no kaihatsu - keika oyobi gaiyo). Text in Japanese. Japan Petroleum Inst., Tokyo, Proc. Symp. Japan Petroleum Inst., 15th, 1972, p. 25-28. 2 refs. (July 10-11.)*

After a series of successful lab tests and bench tests, a pilot plant was constructed for a desulfurization system for flue gases last year, and proved its reliability and workability. The system uses dilute sulfuric acid as an absorbent, eliminates sulfur dioxide from flue gas by an oxidation catalyst, and recovers sulfuric acid and gypsum. Stack gas is sent into a pre-scrubber by a gas blower, where it is cooled and cleaned of dusts. The gas is then sent to the scrubber and brought into contact with the absorbent liquid flowing down from the top.

The SO2 is absorbed in the dilute sulfuric acid. The clean gas goes through the heater at the top and goes out through a stack. The absorbent comes into contact with air while moving back to the top of the tower, and SO2 is oxidized and becomes sulfuric acid again. Some of sulfuric acid recirculates, while a portion of it is extracted into a storage tank and then sent to a crystalization tank, where it is reacted with limestone and forms gypsum. Gypsum is separated in a centrifugal separator and the liquid is recirculated back to the scrubber. The influences of liquid-gas ratio, sulfuric acid concentration, and gypsum composition are presented by graphs and tables.

25640 **APTIC NO. 47242**

Tamura, Zensuke

ACTIVATED CARBON METHOD OF DESULFURIZATION TECHNOLOGY OF FLUE GAS. *(Kasseitanho ni yoru haien datsuryu). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 217-224. (Oct. 17-19.)*

Sulfur dioxide contained in flue gas can be adsorbed by passing the flue gas through a bed filled with activated carbon, and the carbon can be regenerated by washing. The process was confirmed in a 6000 Nm/hr test plant and a 150,000 Nm/hr pilot plant; the Tokyo Electric Power Company is constructing a 420,000 Nm/hr plant, expected to begin operation in September 1972 as the Kasima power station. The dilute sulfuric acid which is produced at the time the carbon is regenerated is recovered as concentrated sulfuric acid or gypsum as occasion demands. To recover gypsum, a new dry method is utilized in which limestone is reacted with the sulfuric acid. The process is economical and simple, requiring little extra equipment, and the gypsum is easy to handle and marketable. Development of the activated carbon method is discussed, as well as the process and its operating variables.

25641 **APTIC NO. 47234**

Tohata, Heiichiro

DESULFURIZATION TECHNIQUE OF FLUE GASES IN JAPAN. *(Wagakuni no haien datsuryu gijutsu no genjo to mondaiten). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 205-215. 9 refs. (Oct. 17-19.)*

Various measures to avoid atmospheric contamination caused by sulfur oxides in relation to the present restrictions of the air pollution control acts are reviewed. The desulfurization of heavy oils and flue gases is considered, as well as importing liquefied natural gas. In Japan, about 40 desulfurization plants with capacities over 10,000 cu Nm/hr have been built or are being built. To investigate what constitutes the most economical process, availability of suitable raw materials for processing and the markets for the possible by-products must be considered. Processes already in commercial use or under pilot plant tests are discussed from the point of view of by-products, such as sodium sulfite, sodium sulfate, gypsum, ammonium sulfate, and others. Over 60% of the above mentioned 40 plants produce sodium sulfite by absorbing flue gases with caustic soda solution. Venturi scrubbers, sieve trays, and the various other types of absorber which have been developed are compared from an engineering point of view. Effects of other flue gas constituents, the removal of nitrogen oxides, and other problems associated with desulfurization techniques are discussed.

25642 **APTIC NO. 47256**

Tsugawa, Hiroji

TOXIC GAS TREATMENT IN ALUMINUM INDUSTRIES. *(Aluminiumu sangyo ni okeru yugai gasu no shori gijutsu). Text in Japanese. Kankyo Sozo (Environ. Creation), 2(10):33-37, Oct. 1972.*

A hydrogen fluoride elimination system for aluminum refining industries and treatment of toxic matter in the exhausts from the primary and secondary aluminum processing are discussed. Exhaust gas from these processes contains hydrogen chloride, chlorine, aluminum chloride, and sometimes sulfur oxides. The AlCl3 is contained in an extremely minute fume form, and the quantity depends on the temperature and force of chlorine gas blown into the aluminum solution. The exhaust gas from the chlorine treatment is sucked by a fan and is sent to the cleansing system, where, the gas is first cooled in a heat exchanger. The temperature is dropped to the degree where the use of bag filters becomes possible. The wall temperature of the heat exchanger must be kept above the dew point. The air used for cooling the gas will be used for warming the stack gas to eliminate white smoke. The flue gas is then sent to bag filters, which eliminate solid particles of AlCl3 and magnesium chloride at a temperature above dew point. The gas then is sent to a scrubber, where it is washed in 10% caustic soda.

25643 **APTIC NO. 47212**

Ushakov, S. G., S. V. Sryvkov, A. I. Polyakov, and M. S. Rudman

ASH TRAPPING BY MEANS OF CYCLONE BATTERY WITH TANGENTIAL GAS INLET AFTER POWER PLANT BOILER FIRING IRSHA-BORODINO BROWN COAL. *(Ulavlivaniye zoly irsha-borodinskogo uglya batareynymi tsikionami s tangentsial nym podvodom gaza). Text in Russian. Elektr. St. (Moscow), no. 9:67-68, 1972. 3 refs.*

First experiences with a cyclone battery with tangential gas inlet, used to trap ash from a power plant boiler firing brown coal with an ash content of 3.1-4.84%, are described. The cyclone battery represents an assembly of two parallel cyclones containing 448 cyclone elements each. The ash trapping efficiency, increasing with boiler load, is 92-93% under normal operational conditions, which corresponds to a residual dust content of 0.33-0.68 g/cu m. The aerodynamic resistance of the cyclone is in a range of 42-85 kg/sq m. The cyclone battery operated reliably, without becoming clogged, over an initial 3500 hour-period.

25644 **APTIC NO. 47279**

Weber, K.

RECOVERY OF SOLVENTS FROM THE VENT AIR. *(Rueckgewinnung von Loesungsmitteln aus der Abluft). Text in German. Fette, Seifen, Anstrichm., 74(10):605-608, Oct. 1972.*

Possibilities to recover solvents, primarily hexane and gasoline, from the vent air of extraction facilities in oil-seed processing mills are described. The vent air, saturated with solvent vapors at a temperature of about 40 C should be cooled to 25 C before release into the atmosphere, which also results in a hexane recovery rate of 57%, with a residual concentration of 900 g/cu m. Incineration, catalytic afterburning, and compression of solvent vapors are not economical, and condensation at low temperature would require a temperature of -28 C for effective separation. Adsorption on solids, and especially absorption in oil represent the only recovery processes of practical interest. After the previously cooled vent air passes the oil column for absorption at an efficiency of about 99%, the absorbed solvent is removed from the oil in a stripping column.

25645 **APTIC NO. 47252**

Yamada, Takeshi

CONTROL OF EMISSIONS FROM STATIONARY COMBUSTION SOURCES. *(Kotei engen kara no chisso sankabutsu no haishutsu boshi gijutsu). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 251-262. 11 refs. (Oct. 17-19.)*

NItrogen oxides from stationary sources are generally recognized as important pollutants involved in photochemical smog formation. The total amount of NOx emitted in Japan is estimated to be approximately 2 million tons a year. Stationary sources account for about 70% of total emissions. Combustion modification techniques--low excess air, flue gas recirculation, and two-stage combustion--seem to be the simplest and least expensive approaches for control of NOx emissions. However, application of these techniques is limited owing to decreases in thermal efficiency or modification of equipment design features. Flue gas treatment techniques such as absorption, adsorption, and reduction of NOx are under development. Nitrogen oxide formation kinetics, combustion modification, and flue gas treatment research and development are discussed.

25646 **APTIC NO. 47284**

Yamada, Tsuyoshi

THE PRESENT STATUS OF FLUE GAS DESULFURIZATION TECHNIQUES. *(Haien datsuryu gijutsu no genjo). Text in Japanese. Kogai Hakua Shobo (Pollution Control), 7(5):204-208, Sept. 1972. 8 refs.*

The total number of desulfurization systems of more than 10,000 cu m/hr capacity in Japan is 55, including those that will be completed in early 1973. Forty-four of them treat boiler combustion gases, 10 of them treat the tail gases from sulfuric acid plants and sulfur recovery systems, and one is for treating sintering furnace gas. Only four of them employ the dry type absorption system, and the rest utilize the wet type. Thirty-six of the 51 wet-type desulfurization systems use caustic soda solution as an absorbent; five use an ammonia solution, four use lime and slake lime slurry, two use sodium sulfite, and four use dilute sulfuric acid as an absorbent. The types of the absorption systems are varied, such as the spray type, tray type, fluid packed tower, venturi scrubber, and liquid-gas cross current contact system. The largest system treats 385,000 cu/hr. The total amount of gases treated by these desulfurization systems is approximately 7,000,000 cu m/hr. This is approximately 500 ton/hr when converted into fuel oil, or 4,000,000 ton/yr. Since the total fuel oil consumption in Japan is approximately 100,000,000 tons, only 4% of the total fuel oil consumption is treated. Calculated further, approximately 10% of the total sulfur emission is being treated yearly.

25647 **APTIC NO. 47217**

Yamaki, Naoomi and Koji Tsuchimoto

CATALYSTS FOR AUTO EXHAUST EMISSION CONTROL. *(Shokubaiho ni yoru jidosha haiki gasu no joka). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 643-656. 20 refs.*

Catalysts for automobile emission control are classified into two kinds: one kind is for the reduction of carbon monoxide and hydrocarbons, and the other is for the reduction of oxides of nitrogen. The catalysts must satisfy chemical, physical, structural, and economical conditions. Patents during the past ten years were read to find catalysts and catalyst supports for the oxidation of CO and HC. Catalysts containing platinum show the best performance, while a copper-chromium catalyst is also excellent. However, even these catalysts lose their activity through poisoning, thermal degradation, or mechanical abrasion. There are two types of catalysts for the removal of oxides of nitrogen: one is used to decompose NOx directly into nitrogen and oxygen, and the other is used to reduce the NOx to nitrogen with CO and HC. Recently, a copper-nickel-graphite catalyst was developed which showed both high activity for NOx and excellent durability.

25648 **APTIC NO. 47189**

Yavorsky, Paul M., Sayeed Akhtar, and Sam Friedman

PROCESS FOR HYDRODESULFURIZATION OF COAL IN A TURBULENT FLOW FIXED-BED REACTOR. *Preprint, American Inst. of Chemical Engineers, New York, 30p., 1972. 7 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 71st, Dallas, Tex., Feb. 20-23, 1972.)*

The operational feasibility of a turbulent-flow catalytic packed-bed reactor was demonstrated for the hydrodesulfurization of three coals slurried in a tar vehicle and one coal in self generated recycle oil. The process yielded high amounts of environmentally acceptable low-sulfur fuel oils. The preliminary variable studies with the coals in tar defined the favorable ranges of hydrogen and coal slurry feed rates, coal concentration, pressure, temperature, and reactor residence time. Extended operations at select conditions provided coal-derived recycle oil for use as a coal feed vehicle, eliminating the startup tar. The totally coal-derived centrifuged synthetic fuel oil, produced at 2000 psig and 450 C from coal containing 3.0% sulfur and 9.4% ash, contained 0.31% sulfur and 1.3% ash. More selective separation of unconverted residual coal could provide fuel oils with sulfur content as low as 0.1% because the bulk of the sulfur is in the benzene-insoluble fraction of the product oil; the sulfur is all organic. Rapid reactor throughput gives relatively low hydrogen consumption, but enough for desulfurization and the incidental liquefaction. The product could be filtered at near-ambient temperature and atmospheric pressure to provide an ashless fuel. (Author abstract modified)

25649 **APTIC NO. 47277**

Yermolayev, V. N.

STUDYING HEAT EXCHANGE PROCESSES OCCURRING IN HIGH-PRESSURE SCRUBBERS. *(Izucheniye teploobmena vysokogo davleniya v skrubbere). Text in Russian. Stal, no. 8:769-771, 1972. 5 refs.*

Heat exchange processes in a non-packed high-pressure scrubber following a cupola furnace were studied. The scrubber had a diameter of 5.5 m and a height of 18.5 m. The capacity for waste gas with an average temperature of 350 C was 205,000 cu m/hr, and the rate of water supply, with a humidity content of 50 g/cu m, was varied from 300 to 450 cu m/hr. The gas flow rate was highest in the scrubber axis and lowest at the periphery, with a ratio of 9.5:1 for an average flow rate of 1.75 m/sec. The distribution of the water flow rates was more uniform with slightly decreasing values towards the periphery. The gas and water temperature distribution at both horizontal and vertical planes was regular. The vertical temperature distribution was described by an S-shaped curve, and two different zones of heat exchange were distinguished. Predominant evaporation, increased humidity content up to 100%, slight variation in the enthalpy, and constant water temperature equaling the dew point in the lower part of the scrubber were observed. Partial condensation of the vapor content, decreased enthalpy and humidity content, and increasing water temperature in the upper part were determined. Variation of the space coefficient of the heat exchange with height, with a maxima in the upper and lower parts and with a minimum at mid-height were noticed. The heat transfer coefficient was dependent on the spray density and on the gas flow rate. Scrubbers with reduced diameter have increased efficiency due to the high gas flow rate. Scrubbers for high-pressure furnace gases should be designed for gas flow rates of 1.75-2.0 m/sec, and for heat exchange space coefficients 650-750 kcal/cu m hr C at a residence time of 10-15 sec.

25650 **APTIC NO. 47117**

Yoshida, Takatoshi, Yoshio Ueno, Katsufumi Hasebe, and Kazushige Ito

DEODORIZATION OF BUTYL AMINE BY MEANS OF WET OXIDATION AND GENERATION OF ACTIVATED CARBON. *(Kasseitan no shisshiki sanka saiseiho ni yoru buchiruamin no dasshu). Text in Japanese. Gesuido Kyokai-shi (J. Japan Sewage Works Assoc.), 9(101):13-15, Oct. 1972.*

Reactivated carbon was used to deodorize butyl amine by the wet oxidation method. Adsorption of butyl amine followed the adsorption temperature formula of Freundlich and others. Deodorization was more effective when the concentration of butyl amine was low. The reactivation rate for used carbon was better when the carbon particle size was large and porosity was maintained, when applying the wet oxidation method. The recovery temperature should be higher than 250 C, and carbon could be reactivated four or five times and used for deodorization.

25651 **APTIC NO. 47125**

Yoshihara, Tadashi, Toshiaki Sakurai, and Takeshi Imura

FOUNDRY OF CAST IRON, SAYAMA FACTORY, HONDA MOTOR CO. - REMARKABLE FEATURE REGARDING TO THE COUNTERMEASURES FOR PUBLIC NUISANCE. *(Honda giken kogyo (kabu) sayama seisaku-sho chuzo kojo - kogai taisaku ni tokushoku). Text in Japanese. Imono (Foundry), 44(7):593-597, July 1972.*

A new melting process at a cast iron foundry uses a cupola of the heating-water-cooling type with a 5 ton/hr capacity. The entire exhaust gas is treated in a recombustion furnace, then the exhaust gas goes through a heat exchanger, and is cooled again by a gas cooler to 400 C. Microparticle dusts go through a wet chamber and then are sent to an electrostatic precipitator. The final gas emission contains less than 0.05 g/cu cm of dust. The radical operation system previously used fluorite and created the problem of fluoride gas. It was replaced by an alumina base solvent specially developed by this plant. Good results are obtained.

1971

25652 **APTIC NO. 47131**

Brink, Joseph A., Jr. and Colin N. Dougald

AIR POLLUTION ABATEMENT IN PLASTIC OPERATIONS. *Preprint, Society of Plastic Engineers, Stamford, Conn., 22p., 1971. 7 refs. (Presented at the Society for Plastic Engineers, Vinyl Division Meeting, Atlanta, Ga., Feb. 11, 1971.)*

During the production of polyvinyl chloride and other vinyl polymers, plasticizer mists and vapors are emitted. To control the air pollution, the raw materials or processes can be revised, but this is rarely completely effective. Incineration of the gases at temperatures in excess of 1500 F and catalytic oxidation have practical and economic disadvantages. Fiber mist eliminators can clean mist-laden gases with high efficiency by inertial impaction, Brownian displacement, and direct interception. The eliminators achieve 100% collection efficiencies for particles larger than 3 micron, and up to 99.98% efficiency for smaller particles. As the gas flow rate through the bed is reduced, the collection efficiencies for submicron particles increase. Pollutants must be in the liquid phase as they pass through the filter bed. In many cases this is accomplished with no external cooling; in others, an inexpensive water spray provides cooling to reduce temperatures to a maximum of 90-120 F to insure efficient cleaning. The separated plasticizers can be collected for further processing and potential use. The first large plant installation of the new system and several more recent plants are described. Odors, haze, and fallout from plumes were eliminated.

25653 **APTIC NO. 45222**

Mayer, R. B., P. A. Berman, and D. D. Aulds

THE ST. JOSEPH LIGHT AND POWER COMPANY PACE-60 COMBINED-CYCLE PLANT. *Proc. Am. Power Conf., vol. 33, p. 484-491, 1971. 2 refs.*

The Westinghouse PACE-60 Combined Cycle Power Plant is a complete power and steam generating plant designed for applications where both electric power and steam are required. It does not include a steam turbine, as the steam is fed to existing plants for sale as heating steam or for use in existing steam turbines. The plant, as applied at the St. Joseph Light and Power Company, produces approximately 60 mw of electric energy at base load and 226,000 lb/hr of steam at 900 F, 900 lb. No supplementary firing is used between the gas turbine and the heat recovery steam generator. The plant utilizes the Model W-501G gas turbine. The turbine drives a hydrogen-cooled generator designed in such a way that it is packaged and installed with the same centerline elevation as normal gas turbine generator stations with air cooled generators. The steam generator is packaged to a high degree. Operating personnel may be kept to a minimum as all alarm information and control is available to the plant operator at one location. The prepackaged components enhance combined-cycle application by providing relatively low installed costs. The use of combined-cycle systems aids in reducing water and air pollution.

1970

25654 **APTIC NO. 47137**

Lee, Charles W., Ronald W. Fuest, and Merlin P. Harvey

REMOVAL OF SO2 FROM FLUE GAS MIXTURES WITH FIBERS CONTAINING POLYMERIC AMINES. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, vol. 10:79-84, 1970.*

Styrene-dimethylaminopropyl maleimide copolyer (SDM) was studied as a sorbent of sulfur dioxide in mixtures approximating coal-burning power plant flue gas and smelter gas. Absorption increased with increased moisture and decreased temperature. Regeneration and reaction mechanisms were also studied, as well as the chemistry, mechanism of formation, and removal of non thermally desorbable (NTD) material. When NTD-containing fibers were treated with dilute alkaline solutions, SO2 sorption increased.

25655 **APTIC NO. 47207**

Riad, M. A., M. I. Rushdy, M. H. Youssef, and I. K. Abdou

SOLVENT SELECTIVITIES FOR SULPHUR BEARING COMPOUNDS AND AROMATICS IN MIDDLE FRACTIONS OF LOCAL PETROLEUM CRUDE. *U.A.R. J. Chem., 13(1):39-47, 1970. 4 refs.*

Solvent refining can be used to desulfurize fuel oil and to produce aromatics. A comparative study was made of solvent power and selectivity for separating aromatic and sulfur compounds in a gas-oil fraction using furfural, aniline, phenol, morpholine, and p-cresol. The effect of water on their selectivities and solvent powers was estimated. Increasing water content in the solvent increased its selectivity. Raffinates, obtained from the two extraction conditions, were used in the evaluation of the selectivities of these solvents. Water-saturated furfural was the best solvent for the extraction of sulfur.

25656 **APTIC NO. 47129**

Rissmann, E. F.

INFRARED STUDIES OF SOLID STATE SIDE REACTIONS INVOLVED IN THE DRY LIMESTONE PROCESS. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, vol. 10:65-70, 1970. 6 refs.*

Dry limestone injection for sulfur dioxide removal from flue gases can sometimes have an incomplete reaction due to dead-burning, wherein the calcined limestone becomes inactive toward hydration or chemical reaction due to a collection of impurities at its surface or to a large loss of surface area and porosity. During calcination, pyrochemical reactions can occur including the formation of impurities which provide a surface barrier to reaction. These reactions were studied by calcining three series of limestone samples as well as pure magnesium and calcium oxides. Spectrophotometry showed that chemical composition and particle size influenced the spectra of the limestones. The CaO and MgO were exposed to 25 mm water

vapor to study hydration. The presence of sharp OH bands confirmed the hydration of both CaO and MgO.

25657 **APTIC NO. 47134**

Sutt, R. F., R. S. Joyce, M. F. Kranc, J. R. Lutchko, and G. S. Tobias

EFFECTIVE PROCESSES FOR THE OXIDATION OF CO TO CO2. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, vol. 10:71-78, 1970. 7 refs.*

The oxidation of carbon monoxide to carbon dioxide was studied using an artificial ammonia synthesis gas containing 2.6% CO, 20% nitrogen, 20% CO2, and the balance hydrogen. The gas was passed through a carbon bed in continuous and intermittent processes. In the intermittent process, loss in efficiency occurred above 100 C due to competition of hydrogen for the impregnated carbon. At 100 C, excellent selectivity was obtained. In systems without hydrogen or other reducing agents, higher efficiencies may be obtained above the 106 C maximum. Water vapor may act as a heat sink, removing available heat energy and reducing reaction rates but not affecting capacity. In the continuous process, a maximum conversion occurred in the 80-90% range at 150 C; the optimum temperature varied with the length of the run. Oxygen, as air, was added to the synthesis gas prior to its passage through the bed; the oxidation was influenced by the amount of oxygen in the feed gas. Complete oxidation could be obtained only by using four times the stoichiometric oxygen requirement. The selectivity of the transition metal catalyst decreased with increasing temperature and was independent of the oxygen content of the gas. Copper chloride-platinum metal chloride catalysts were evaluated, and the effect of pressure was noted. In waste gas treatment, heat generation is not anticipated as a problem, and high degrees of selectivity, quantitative oxidation of CO, and the absence of excess oxygen are not required. Carbon-based catalysts could be applied to the destruction of CO in a variety of gases for air pollution abatement and would facilitate catalytic oxidation at relatively low temperatures.

MEASUREMENT METHODS

1972

25658 **APTIC NO. 47191**

Atomic Energy Commission, New York, Health and Safety Lab.

AIR SAMPLING. *In: HASL Procedures Manual. Rept. TID-4500, HASL-300, p. 03-01 to 03-05, 1972.*

NTIS: HASL-300

The general characteristics of air sampling equipment are reviewed. The essential elements of an air sampler are the sampling medium itself, an airflow meter, and an air mover to draw air through the system at a prescribed rate. Factors that enter the selection of air movers are rate of airflow; resistance to airflow imposed by the sampling medium; variation of resistance during sampling; limits of size and weight; and available power. Cost, durability, and ease of maintenance are basic considerations. Types of air movers include manual pumps, positive displacement pumps, and centrifugal pumps.

25659 **APTIC NO. 47192**

Atomic Energy Commission, New York Health and Safety Lab.

FLUORIMETRIC DETERMINATION OF BERYLLIUM. *In: HASL Procedures Manual. Rept. TID-4500, HASL-300, p. 01-01 to 01-08, 1972. 1 ref.*

NTIS: HASL-300

The analytical procedure for the determination of beryllium by a fluorimetric technique is outlined. Beryllium is determined by the fluorescence of its Morin complex in sodium hydroxide solution. Separation from most elements is required prior to determination, since the fluorescence is not specific. The apparatus and reagent requirements, sample preparation, and experimental procedure are reviewed. The method is applicable to air dust filter samples, tissue, water, urine, and soil. Calibration is described.

25660 **APTIC NO. 47193**

Atomic Energy Commission, New York, Health and Safety Lab.

SPECTROPHOTOMETRIC DETERMINATION OF FLUORIDE ION. *In: HASL Procedures Manual. Rept. TID-4500, HASL-300, p. 01-01 to 01-05, 1972. 1 ref.*

NTIS: HASL-300

The analytical procedure for the determination of fluoride ions by spectrophotometry is outlined. The analysis depends on fluoride quenching of the thorium-chrome Azurol S lake. The apparatus and reagents requirement, sample preparation, and experimental techniques are reviewed. The method is applicable to air samples, air filters, water, or urine.

25661 **APTIC NO. 47194**

Atomic Energy Commission, New York, Health and Safety Lab.

TRACE METALS - PB, V, CU, ZN, CD, CR, MN, NI. *In: HASL Procedures Manual. Rept. TId-4500, HASL-300, p. 04-01 to 04-03, 1972*

NTIS: HASL-300

The analytical procedure for the determination of trace metals, i.e., lead, vanadium, copper, zinc, cadmium, chromium, manganese, and nickel, by atomic absorption spectrophotometry is outlined. The apparatus, reagents, sample preparation, solubilization, and analytical procedures are reviewed. The method was tested for precipitation samples, air filters, and tap water.

25662 **APTIC NO. 47225**

Adams, Donald F.

MODERN ASPECTS OF AIR MONITORING EQUIPMENT. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972. p. 101-129. 87 refs. (Oct. 17-19.)*

The first generation of air monitoring equipment which is in wide use today is evaluated and their limitations are pointed out. A systems approach, performance criteria, and specifications are considered for the improvement of presently available air monitoring methods and those yet to be developed and commercialized. Measurement objectives, calibration, sample delivery probes, sample treatment reactions, detectors, flow measurement and regulation, signal processors, signal readout, and data interpretation are included, as well as performance criteria and the collaborative testing of air monitoring methods. Chemiluminescent detectors, gas chromatography, electrochemical detectors, spectrometry, photometric methods, and various remote sensing metnods are discussed, in addition to condensation nuclei formation analyzers and the measurement of physical properties.

25663 **APTIC NO. 47300**

Blum, Wolfgang and Gerhart Rinne

IDENTIFICATION OF HYDROCARBONS IN THE EXHAUST GASES FROM AUTOMOBILE ENGINES WITH THE AID OF A COMBINATION OF GAS CHROMATOGRAPH/MASS SPECTROMETER. *(Identifizierung von Kohlenwasserstoffen in Abgasen von Automobilmotoren mit Hilfe einer Kombination Gaschromatograph-Massenspektrometer). Text in German. Motoretech. Z. (Stuttgart), 33(10):403-407, 1972. 15 refs.*

A gas chromatograph was combined with a quadrupol mass spectrometer for identification of the hydrocarbons in the exhaust gas of an Audi 100 S passenger car. The exhaust gas samples were taken during idling. A 500 ml glass cylinder with teflon cocks on both ends was inserted into the exhaust pipe. One cock was opened; the cylinder filled with exhaust gas. For avoidance of water condensation, a temperature of 60 C was maintained. One milliliter of the sample was injected into the gas chromatograph. The C1 to C3 hydrocarbons were not analyzed because they interfere with the inorganic gases oxygen, nitrogen, carbon monoxide and dioxide, and nitric oxide. For their separation, a packed column can be used. The peaks from gas chromatographic analysis were identified with the mass spectrometer. The hydrocarbon fractions in the exhaust gas during idling corresponded largely to the fuel composition. The application of a peak selector in connection with a quadrupol mass spectrometer for group analysis is discussed.

25664 **APTIC NO. 47176**

Bricard, Jean, Pierre Gazes, Philippe Reiss, and Pierre-Yves Turpin

CONTRIBUTION TO THE STUDY OF ATMOSPHERIC AEROSOLS IN THE SUBMICRON RANGE BY MEANS OF PHOTOELECTRIC METHODS. *(Contribution a l etude de l aerosol atmospherique dans le domaine submicronique a l aide de methodes photoelectriques). Text in French. C.R. Acad. Sci. Paris, Ser. B, 275(7):263-266, Aug. 1972. 5 refs.*

Studies concerning the detailed granulometry of atmospheric aerosols by means of two photometers are described. The light scattered by individual particles in a homogenously illuminated parallelepipedal optic space was detected by photodetectors connected with a photomultiplier for the determination of the particle size. The probability of more than one particle, being present simultaneously within the optic space was 5%. The two photometers were used simultaneously to detect particles with radii of 0.03-0.2 micron and with radii larger than 0.2 micron and in a concentration range below 30,000/cu cm, respectively. At the same time, the total particle concentration was recorded by means of a condensation nuclei counter, and the concentration of particles with radii below 0.3 micron was derived from the difference between the readings of this condensation nuclei counter and the combined reading of the two photometers.

25665 **APTIC NO. 47199**

Brink, Joseph A., Eugene D. Kennedy, and Henry S. Yu

PARTICLE SIZE MEASUREMENTS WITH CASCADE IMPACTORS. *Preprint, American Inst of Chemical Engineers, New York, 40p., 1972. 23 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 65th, New York, Nov. 26-30, 1972.)*

Improvements in impactor design and new techniques for impactor use are reviewed. Design variables, data analysis, instrument components, dust sampling and opacity measurement techniques, and in-stack sampling procedures are examined. Cascade impactors are widely used to measure the particle size distribution of both liquid and solid particles from various chemical processes.

25666 **APTIC NO. 47226**

Brown, H.

MEASUREMENT OF DUST AND PARTICULATE MATTERS. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 131-146. (Oct. 17-19.)*

The history of the pollution problem in Britain is briefly reviewed, and the quality of the air in Britain today is mentioned. Domestic smoke emissions, products of combustion, emission control, and the significance of dust in the atmosphere are considered. A practical method for measuring grit and dust is outlined. Particulate matter sizing is also discussed. Official standards in Great Britain are presented for furnace emissions. Gravimetric, optical, and the Sick Optik-Electronik continuous monitoring methods are mentioned.

25667 **APTIC NO. 47177**

Chatot, G., R. Dangy-Caye, and R. Fontanges

STUDIES ON POLYCYCLIC HYDROCARBONS IN THE ATMOSPHERE. II. APPLICATION OF A COMBINED GAS-CHROMATOGRAPHIC - THIN-LAYER- CHROMATOGRAPHIC TECHNIQUE TO THE DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS. *(Etude des hydrocarbures polycycliques de l atmosphere. II. Application du couplage chromatographie en phase gazeuse-chromatographie sur couches minces au dosage des arenes polynucleaires). Text in French. J. Chromatog., 72(1):202-206, Oct. 1972. 10 refs.*

A combined thin-layer chromatographic-gas chromatographic technique for the routine quantitative determination of polycyclic aromatic hydrocarbons previously identified by ultraviolet or fluorescent spectrographic techniques is described. The thin-layer chromatographic system involved preparative chromatography with silicagel as an adsorbent and benzene as a solvent, and another bidimensional chromatography with alumina-cellulose acetate as an adsorbent and pentane-ether and ethanol-toluene-water as solvent systems. The fluorescent zone in the first chromatographic system was eluted by benzene, and transferred to the second system, from which the individual spots were eluted separately by means of benzene, and the eluate was injected into a gas chromatography equipped with flame ionization detector. Chromosorb G as support, and SE-52 dissolved in chloroform as stationary phase were used. The initial temperature was 100 C, which was increased at a rate of 3 C/min after 3 min to a final temperature of 290 C. The injection temperature was 250 C, and nitrogen as carrier gas was used. It was possible to rapidly determine the total polycyclic aromatic hydrocarbon content, or 13 different hydrocarbons by means of this combined method. Two different polycyclic aromatic hydrocarbons present in the same spot can be distinguished by their respective retention times, except for the benz(a)anthracene-triphenylene combination. Dust samples from the Lyon regions contained about 1000 micrograms of polycyclic aromatic hydrocarbons per g.

25668 **APTIC NO. 47205**

Dmitriyev, M. T., L. N. Tarasova, and L. D. Pribytkov

GAS CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF THE TOTAL ORGANIC CONTENT IN THE AIR. *(Gazovyy khromatograficheskiy metod opredeleniya summarnogo soderzhaniya organicheskikh veshchestv v vozdukhe). Text in Russian. Gigiena i Sanit., no. 8:66-69, 1972. 2 refs.*

A gas chromatographic method using a flame ionization detector for the determination of the total organic content of the air is described. An air sample volume of 5 ml is directly introduced into the chromatograph, and the respective concentrations can be calculated from the peaks obtained. The peak area is strongly linear function of the amount of carbon introduced into the flame ionization detector. Since the degree of ionization in the flame-ionization detector of different hydrocarbons is nearly identical, the total hydrocarbon content can be calculated from an average of 31.2 millicoulombs/g, obtained for 28 different hydrocarbons. The flame ionization detector can be calibrated for any known component of the mixture, such as for hexane or octane. This procedure, using no chromatographic column, has the advantages of great reproducibility, rapidity, and reliability due to the elimination of losses caused by the sorption on the stationary phase.

25669 **APTIC NO. 47276**

Doering, C. [illegible], R. Geyer, and P. Roeske

GAS-CHROMATOGRAPHIC ANALYSIS OF NITROGEN OXIDES, PART I. THE BEHAVIOR OF NITROGEN OXIDES ON VARIOUS CARRIER MATERIALS. *(Gaschromatographische Analyse von Stickoxiden, I. Das Verhalten der Stickoxide zu verschiedenen Traegermaterialien). Text in German. Acta Chim. Acad. Sci. Hung., 73(4):399-410, 1972. 72 refs.*

The behavior of nitrogen oxides on various gas chromatographic adsorbents was studied. The adsorption enthalpies of nitric oxide, nitrous oxide, and nitrogen dioxide on such adsorbents as silicagel, popous glass, molecular sieves, Porapak Q, alumina, polytetrafluoroethylene, and two different trifluoromonochloroethylene polymers were determined. The adsorption of NO2 was partially irreversible on all these adsorbents but polytetrafluoroethylene. While the adsorptive separation of NO from NO2 caused no problem, the phenomena observed during this separation indicate the effect of a possible NO NO2 versus nitrous anhydride equilibrium.

25670 **APTIC NO. 47278**

Gilbert, Traugott

MONITORING INDUSTRIAL EMISSIONS. *(Die Ueberwachung industrieller Emissionen). Text in German. TUE (Tech. Ueberwach.), 13(7/8):247-250, July-Aug. 1972.*

Methods for continuous monitoring and individual analysis of industrial emissions are reviewed. Continuous monitoring of industrial emissions, now required for solid pollutants and sulfur dioxide, and expected to be adopted also for carbon monoxide and nitrogen oxides, is increasingly used in a widening range of industries. Individual gas samples can be analyzed by means of photometric, colorimetric, gas chromatographic, mass spectrometric infrared spectrometric ultraviolet and visible light absorption, coulometric, colorimetric, and conductivity methods. The quantitative analysis of odorous emissions is still an unsolved problem. Particulate emissions can be measured by means of gravimetric, photoelectric, electric, radiometric, and smoke density measuring method. Examples of emission measurements in different industries are given.

25671 **APTIC NO. 47265**

Ikeda, Horoshi, Naojiro Kikuchi, Minoru Obata, Toshihiko Fukuda, and Katsuo Matsmoto

TWO-LAMP TEST APPARATUS FOR THE CALIBRATION OF OZONE SPECTROPHOTOMETER. *(Ozon bunko kodokei-yo 2 ranpu tenken sochi ni tsuite). Text in Japanese. Kisho cho Kenkyu Jiho (Journal of Meteorological Research (Tokyo), 24(4):161-163, 1972. 6 refs.*

An improved two-lamp test apparatus was designed for the calibration of ozone spectrophotometers. Movie projection lamps in the old apparatus were replaced by 500-watt iodine lamps to increase the ultraviolet radiation, and a water cooling system was added to prevent overheating. The improved apparatus was better, especially in the regions where accurate measurement was difficult.

25672 **APTIC NO. 47266**

Ikeda, Horoshi and Minoru Obata

AN AUTOMATIC RECORDING DEVICE FOR OZONE SPECTROPHOTOMETER. *(Ozon bunko kodokei no jidoka ni tsuite). Text in Japanese. Kishocho Kenkyu Jiho (Journal of Meteorological Research) (Tokyo), 24(4):151-160, 1972. 2 refs.*

An automatic recording device was developed for use with an ozone spectrophotometer for observation of the Umkehr effect. The equipment comprises a DC amplifier that drives a servo motor by the output signal of the spectrophotometer; a servo motor unit for dial control; and a recording unit. Rough adjustment of the zero detector causes considerable errors in measurement when the sun is very low, but careful adjustment has obtained satisfactory auto-recorded Umkehr curves.

25673 **APTIC NO. 47102**

Kato, Takayoshi and Moroo Abe

MEASUREMENT OF SUSPENDED PARTICULATES AND THE APPARATUS. *(Fuyu funjin no sokutei to sono keiki). Text in Japanese. PPM (Japan), 3(11):48-55, Nov. 1972.*

Various types of measuring apparatus for suspended particulates are discussed with comments and illustrations. Measurement methods include impingers, dust collectors, electrostatic precipitators, high-volume samplers, Andersen samplers, light scattering dust counters, paper holders with a separator, low-volume samplers, cascade impactors, and filter collectors. A standard particulate creator is also discussed with illustrations. Other areas concerning suspended particulates that require further studies are particle size distribution, compositions, shapes, particle behavior; various instruments are being developed with such specific requirements.

25674 **APTIC NO. 47238**

Katou, Tatsuo

CHEMICAL ANALYSIS OF ODOR POLLUTANTS. *(Akushu seibun no bunseki). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan 1972, p. 191-201. (Oct. 17-19.)*

Sampling and chemical analyses of odorous compounds are discussed. Both gas chromatographic and colorimetric methods are considered. Odorimetry is not as accurate a method. Sampling techniques include direct, vacuum bottle, and blowing out with nitrogen.

25675 **APTIC NO. 47241**

Komaki, Yoshio

MOBILE SMOG CHAMBERS. *(Idoshiki Sumoggu Chanba ni tsuite). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 461-464. (Oct. 17-19.)*

Mobile smog chambers comprise a smog chamber car and an analysis car. Each smog chamber car consists of a sampling device, and operational apparatus, a smog chamber, an ultraviolet irradiation device, a motor and a power generator for irradiation, a light adjustment device, a temperature control device, and a pressure control device. The analysis car consists of a meter and a recorder, a data compilation device, a docking device with the chamber car, a sampling device, a motor and a power generator, a meteorological observation meter, an operation table, a work table, a sink, and other small matters. The methods of measurements used are non-dispersive infrared spectrometry for carbon monoxide, iodimetry for oxidant, colorimetry using the Saltzman reagent for nitrogen oxides and nitrogen dioxide, electroconductivity for sulfur dioxide, a flame ionization detector for hydrocarbons, and the light scattering for dusts. Desirably, samplings should be taken from an altitude of several hundred meters or less, but realistically, it is only possible to take samples from the height of about 10 m. The dilution should be about 10%, never exceeding 25%.

25676 **APTIC NO. 47113**

Lee, Robert E., Jr.

SIZE DISTRIBUTION OF SUSPENDED PARTICULATES IN AIR. *Res. Dev., 23(6):18-21, June 1972. 11 refs.*

Since the degree of respiratory penetration is a direct function of aerodynamic size, information concerning the particle size distribution of suspended particulates is essential to assess the inhalation health hazard. Particle size as well as the concentration of aerosol constituents determines the extent of visibility reduction, particle-particle and particle-gas interactions, soil-

ing, deterioration of materials, and a wide range of other atmospheric phenomena. Available particle sizing instruments and techniques are described. Microscopic methods, intermittent fractionating devices, and continuous monitoring devices are included. The National Air Surveillance Networks cascade impactor collection system is outlined.

25677 **APTIC NO. 47107**

Lett, R. G., W. A. Steiner, and Y. C. Fu

MASS SPECTROMETRY STUDY OF MICROWAVE DISCHARGES IN HYDROGEN-CARBON MONOXIDE-ARGON MIXTURES. *J. Phys. Chem., 76(21):2941-1946, Oct. 12, 1972. 42 refs.*

Microwave discharges in a flow system containing hydrogen-carbon monoxide-argon mixtures were sampled by a time-of-flight mass spectrometer. Depending upon experimental conditions, from 5-30% of the carbon monoxide was converted to methane, acetylene, and carbon dioxide. The formation of the major gaseous products was studied as a function of reactant gas composition, pressure, microwave power, and flow rate. Consumption of carbon monoxide appears to be first order at short residence times. Ions were sampled from the discharges at pressures below 5 torr. (Author abstract modified)

25678 **APTIC NO. 47273**

Matsui, Hiroshi and Tsutomu Ohata

GENERAL EXPRESSION OF THE FUNCTIONAL COLLECTION EFFICIENCY FOR A CASCADE IMPACTOR. *J. Nucl. Sci. Technol., 9(10):620-621, Oct. 1972. 10 refs.*

The functional efficiency of a cascade impactor must be known not only for determining the performance of the impactor but also for designing the impactor and considering the problems involved. An equation is derived in which Ranz and Wong s theoretical relation between collection efficiency and the dimensionless inertial parameter of rectangular and round jet impactors correlates well with experimental data.

25679 **APTIC NO. 47235**

Matsushita, Hidetsuru

ANALYTICAL METHODS FOR POLYNUCLEAR HYDROCARBONS IN ENVIRONMENTAL AIR. *(Takan hokozoku tanka suiso no bunsekiho). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 175-190. 39 refs. (Oct. 17-19.)*

Methods are described for the simple determination of several polynuclear hydrocarbons in air, for the detection and determination of many polynuclear hydrocarbons in the particulates suspended in air, and for the quick determination of benzo(a)pyrene in air. The first method involves collection of suspended particulates, extraction by vacuum sublimation, separation by one-dimensional dual band thin-layer chromatography, and identification and determination by spectrofluorometry. The second method involves separation by two-dimensional dual band thin-layer chromatography, while the last method requires all the same steps except for the chromatographic separation. Carcinogenic compounds are discussed.

25680 **APTIC NO. 47275**

Murata, Mikio and Susumu Kitani

DETERMINATION OF SODIUM FOR STUDY OF SODIUM AEROSOL BEHAVIOR BY ATOMIC ABSORPTION SPECTROPHOTOMETRY. *J. Nucl. Sci. Technol., 9(10):622-623, Oct. 1972. 3 refs.*

For the study of the behavior of a sodium oxide aerosol, atomic absorption spectrophotometry was applied for the determination of concentrations of sodium in the 10-1000 ppb range. Depending on humidity and the amount of carbon dioxide in the atmosphere, the sodium oxide may change to sodium hydroxide, sodium bicarbonate, or sodium carbonate. Thus, the sodium oxide aerosol collected by filtration consists of several sodium compounds. When absorbance was measured on standard aqueous solutions of sodium chloride, sodium hydroxide, and sodium carbonate, it was found that these compounds presented differences in their analytical curves. Moreover, the relation between absorbance and sodium concentration was not linear. Addition of a suitable quantity of potassium to the sodium solutions solves this problem.

25681 **APTIC NO. 47126**

Nishida, Taisuke

PROBLEMS OF THE ANALYTICAL METHOD FOR NITROGEN OXIDES IN GASES. *(Gasu-chu no chisso sankabutsu no buneseki ni okeru mondaiten ni tsuite). Text in Japanese. Association for the Prevention of Industrial Public Nuisance (Japan), Proc. Assoc. Prev. Ind. Public Nuisance Symp., 2nd, Japan, 1972, p. 25-28. (Oct. 3-7.)*

With regard to the unsolved problems of the Saltzman method of analyzing nitrogen oxides, the method of sampling, inaccuracy of index, the calibration method, and the influences of sulfur dioxide were examined. In order to obtain an accurate Saltzman index, a high concentration NOx standard gas was sampled in a polyethylene bag. A given amount was separated into another bag and was diluted by nitrogen gas. The NOx concentration was then measured. It had a good linear relationship with absorption. Calibration was successfully obtained by first using the Saltzman method and the PDS method on a high concentration NOx standard gas in a polyethylene bag. The measurement obtained by the Saltzman method was calibrated by the measurement by the PDS method. An absolute calibration line was obtained. In order to eliminate the influence of SO2 gas on NOx gas measurement, SO2 gas was eliminated. Hydrogen peroxide solution was used and the influences of its concentration and the flow speed of the test gas were examined. It was discovered that SO2 gas was eliminated 100% regardless of the flow speed or H2O2 concentration. On the other hand, NOx gas was also absorbed consistently at 7 to 10% rate regardless of the concentration of H2O2 or the flow speed of the gas. These matters must be taken into consideration when measuring NOx gas.

25682 **APTIC NO. 47237**

Nukada, Masami

PREPARING OF CALIBRATION GASES AT LOWER PART PER MILLION LEVEL AND ITS SOME PROBLEMS. *(Teimodo kosei gasu no chosei to mondaiten). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 71-100. 8 refs. (Oct. 17-19.)*

The permeation tube method, the flow-ratio dilution method, or use of a high pressure steel cylinder are generally employed for the calibration of air pollution gas analyzers. Some problems associated with the use of calibration gases filled in a high pressure steel cylinder are discussed, although this is considered the most convenient and accurate method. Accuracy of this method for determining sulfur dioxide, carbon monoxide, nitrogen dioxide, nitric oxide, or hydrocarbons (propane or methane) was then compared with a gravimetric method. Various influences on a flame ionization detector are mentioned.

25683 **APTIC NO. 47258**

Robinson, J. W., P. J. Slevin, G. D. Hindman, and D. K. Wolcott

NON-FLAME ATOMIC ABSORPTION IN THE VACUUM ULTRAVIOLET REGION. THE DIRECT DETERMINATION OF MERCURY IN AIR AT THE 184.9-NM RESONANCE LINE. *Anal. Chim. Acta, 61(3):431-439, Oct. 1972. 7 refs.*

Mercury in the atmosphere was analyzed continuously without prior scrubbing or sample collection, utilizing the mercury resonance line at 184.9 nm. This was made possible with a radiofrequency carbon rod atomizer and by pumping the monochromator with argon. Sensitivity was 0.1 microgram Hg/cu m. Various mercury lamp sources were investigated; studies were also carried out with the absorption tube at room temperature with inherently narrower mercury absorption lines. Strong reversal of the resonance lines on commercial hollow cathodes was indicated, and some anomalous temperature affects were observed. To determine the lowest level of molecular absorption, a study was made on the effect of flow rate on the molecular absorption of ambient air. The procedure for the continuous determination of mercury in air is given. The feasibility was also demonstrated of using this system to record atomic absorption signals of arsenic and selenium. (Author summary modified)

25684 **APTIC NO. 47175**

Scheide, Eugene P. and George G. Guilbault

PIEZOELECTRIC DETECTORS FOR ORGANOPHOSPHORUS COMPOUNDS AND PESTICIDES. *Anal. Chem., 44(11):1764-1768, Sept. 1972. 25 refs.*

A quartz piezoelectric crystal coated with a substrate can be used to detect small mass changes caused by the selective adsorption of organophosphorus compounds and pesticides. Incorporation of the crystal into a variable oscillator circuit and measurement of the change in frequency of the crystal due to the increase in mass gives a highly sensitive indication of the amount of organophosphorus compound present in the atmosphere down to the ppm level. Instrumentation is relatively inexpensive and can easily be used in the field. Analysis is nondestructive and requires very little time. The AT cut quartz crystals with fundamental frequencies of 9.0 MHz were coated with various inorganic substrates and were evaluated for selectivity and sensitivity with respect to organophosphorus pollutants. Other parameters that affect the efficiency of the detector were studied and evaluated. The detector has potential use as both an air pollution sensor and as a specific gas chromatography detector. (Author abstract)

25685 **APTIC NO. 47163**

Tange, Yoshinobu

OFFENSIVE ODOR MEASUREMENT FOR PULP AND PAPER INDUSTRY. *(Kami parupu sangyo no akushu sokutei ni tsuite). Text in Japanese. Kami-pa Gikyoshi (J. Japan Tech. Assoc. Pulp Paper Ind.), 26(11):540-544, Nov. 1972.*

The characteristics of odor measurement for the pulp and paper industries, odor intensity of various elements in these industries, the methods of measuring methyl mercaptan, hydrogen sulfide, and methyl sulfide designated by law, and related terms in odor measurement are presented. The accepted method of measuring the above mentioned odor elements include the preparation of reagent, standard solution, and the use of gas chromatography. The greatest obstacle in odor measurement is the fact that the methods are still in the lab stage and have not been developed to the level of application to industries. Measurement by sampling very much depends on the skill of the test conductor. Measuring of methyl mercaptan is especially problematical due to the instability of this material. Its low threshold is recognized by all, but on-site actual measurement often results in zero to traceable quantity.

25686 **APTIC NO. 47218**

Yanagisawa, Saburo

ON MEASURING METHODS OF AIR POLLUTION IN JAPAN AND THEIR PROBLEMS. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan 1972, p. 63-69. 27 refs. (Oct. 17-19.)*

Methods in use in Japan for the measurement of sulfur oxides, oxides of nitrogen, carbon monoxide and dioxide, hydrocarbons, oxidants, chloride, hydrogen chloride, fluoride, hydrogen sulfide, cyanide, ammonia, acrolein, mercaptan, bromide, phenols, particulate matter, and various other organic compounds, are listed. Their range of sensitivity is also indicated, in addition to whether they are batch or continuous methods. These methods include titration, photometry, conductivity, ultraviolet and infrared spectrometry, coulometry, lead dioxide, colorimetry, potentiometry, fluorescence, flame ionization, gas chromatography, gravimetry, impinger, impactor, counting, and chemiluminescence.

25687 **APTIC NO. 47165**

Yatabe, Teruo

STUDY ON METHODS FOR DETERMINATION OF NITROGEN OXIDES IN FLUE GASES (PART II). IMPROVED NAPHTHYL-ETHYLENE-DIAMINE METHOD AND COMPARISON WITH PHENOL-DISULFONIC-ACID AND CONTINUOUS INSTRUMENTAL METHODS. *(Haigasu chu ni okeru chisso sankabutsu sokutei-ho no kento (dainiho). Nafuchiru echiren jiamin-ho no kairyo oyobi kairyoho, fenoru jisuruhonsanho, jido renzoku bunsekiho ni yoru sokuteichi no sogo hikaku). Text in Japanese. Electric Power Industry, Tokyo (Japan), Central Research Inst. Proc. Heat Power Meet., 1972, p. 1-32. 9 refs. (Aug.)*

Improved measurement methods were developed for the determination of nitrogen oxide concentrations in flue gases. The naphthyl ethylene-diamine method substitutes oxygen oxidation for air oxidation, incorporates sulfur dioxide removal by hydrogen peroxide scrubbing, and modifies the Saltzman factor from 0.50 to 0.70. The measurement values of the improved method were comparable with the results of the phenol-disulfonic-acid method and the continuous instrumental methods, i.e., non-dispersive infrared spectroscopy, chemiluminescence, ultraviolet spectroscopy, and electrochemical transducers. The improved method for the determination of nitrogen dioxide in flue gases containing NO2 and nitric oxide substitutes Saltzman reagents for sodium hydroxide as the absorbing solution.

1971

25688 **APTIC NO. 47141**

Bandyopadhyay, M. and M. K. Chakraborty

DIMENSION OF A GRAVIMETRIC COAL-DUST COLLECTING SAMPLER. *J. Mines, Metals Fuels, 19(5):143-145, May 1971. 6 refs.*

The necessary computation for the preliminary design of a gravimetric size-selective coal dust collector was made on the principle of horizontal elutriation. The proposed sampler may be useful for the determination of Mass/Number Index (MNI) of coal dust. MNI represents the mass concentration in mg/cu m corresponding to a number concentration of 1000 particles/cu cm of airborne dust within appropriate size range. (Author summary modified)

25689 **APTIC NO. 47130**

Barringer, A. R. and J. H. Davies

INVESTIGATIONS IN CORRELATION SPECTROSCOPY AND INTERFEROMETRY FOR THE REMOTE MONITORING OF AIR POLLUTION. *Preprint, 41p., 1971. 6 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 1971.)*

A correlation spectrometer for sulfur dioxide, nitrogen dioxide, and iodine was successfully developed and used in field tests from aircraft altitudes. Measurements over Chicago were made at 114,000 ft from a balloon with two correlation spectrometers, one measuring SO2 in the ultraviolet region, the other measuring NO2 in the blue visible. The tests showed the validity of the correlation technique to monitor SO2 and NO2 by clearly demonstrating that its efficient solar reflected radia-

tion, modified by target gas signatures impressed at the earth s surface, can be obtained at satellite altitudes. The characteristics of the signals obtained at the balloon were identical to those theoretically produced by mathematical modeling. A multi-gas sensor, COSPEC II, was developed which uses the long path monitoring approach with active light sources. A correlation interferometer was developed to measure carbon monoxide and to remotely measure CO burdens to detect CO anomalies associated with the CO sink mechanism. General aspects of remote sensing are discussed including the advantages and disadvantages of ultraviolet versus infrared sensing. Atmospheric scattering and extinction, ground reflectivity, and terrain characteristics can effect remote sensing. A ground chopper instrument comprising two radiometers was designed to measure scattered light. Remote sensors can be used for pollution monitoring, including the measurement of the total vertical burden, mass transport, and regional distribution of pollution.

1970

25690 **APTIC NO. 47197**

Decker, Clifford E., James R. Smith, and Gordon C. Ortman

AN EVALUATION OF TECHNIQUES FOR THE MEASUREMENT OF LOW CONCENTRATIONS OF TRACE GASES IN THE ATMOSPHERE. (FINAL REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Engineering and Environmental Sciences Div. and Public Health Service, Durham, N. C., National Air Pollution Control Administration, NAPCA Contract CPA 22-69-109, Rept. APTD-0956, Feb. 1970. 9 refs.*

NTIS: PB 208239

A research cruise was conducted aboard from Wilmington, North Carolina, to the vicinity of the equator and back during June and July 1969. Ozone, total oxidant, carbon monoxide, and methane concentrations were measured, and hourly and diurnal results are given. A comparative evaluation of the chemiluminescent and coulometric techniques for measuring ozone and oxidant at low atmospheric concentrations was conducted. The chemiluminescent meter was more reliable than the coulometric meter under the conditions encountered. Calibration methods are also described; the neutral buffered potassium iodide method was used for a referee for calibration of oxidant measurements. Recommendations are made for future work.

AIR QUALITY MEASUREMENTS

1972

25691 **APTIC NO. 47172**

Oita Prefectural Government (Japan), Bureau of Pollution Control

AIR POLLUTION CONDITION AND COUNTERMEASURES IN THE OITA-SAGNOSEKI AREA. *(Oita-Saganoseki chiku no taiki osen no genkyo to taisaku). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 72: 2-8, Sept. 1972.*

The air pollution monitoring network of the Oita-Saga Coastal Industrial area was originated in March 1966 with two monitoring stations using the electroconductivity method. The sources of sulfur oxides emission increased steadily since then, especially with construction of petroleum chemical plants, thermal power plants, and ironworks. In 1971, the total SOx emission was 3724 N cu/hr, of which 1275 N cu m/hr (34%) was from the oil-burning thermal power plants. In 1972, with the building of New Japan Ironworks, the total SOx emission in the area increased to 4908 N cu m/hr from the total 30 stacks in the area. In January of this year, a telemeter system of monitoring was initiated, and the network now comprises 60 continuous measuring stations. Electroconductivity and lead dioxide methods are used. In the Oita area, the SOx concentration grew from 0.021 ppm to 0.023 between 1968 to 1969, but it dropped to 0.019 ppm in 1971. In the Saganoseki area, the concentration dropped from 0.041 to 0.020 ppm between 1969 and 1970. The 1971 measurement was 0.019 ppm. When the measurements of 1970 and 1971 were compared, some decrease of pollutant concentration was noted near pollution sources, but measurements taken far away from pollution sources were rather high. Cooperative work and agreements between industries and local administration with regard to abatement of emission, use of better fuel, installation of pollution control devices, and no fault compensation in case of damages are advocated.

25692 **APTIC NO. 47236**

Asakuno, Kunihiko

INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF AIRBORNE PARTICULATE MATTER. *(Taikichu no ryushi osenshitsu no hoshaka bunseki). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int Symp. Air Pollut., Tokyo, Japan, 1972, p. 163-174. 5 refs. (Oct. 17-19.)*

Application of neutron activation analysis to the determination of elements in airborne particulate matter is discussed. The method is very rapid and sensitive. Size spectra of airborne heavy metals were examined by this method at monitoring stations in Tokyo. Results are given of the metallic composition of particulates in Tokyo.

25693 **APTIC NO. 47269**

Bach, Wilfrid and Kenneth Lennon

AIR POLLUTION AND HEALTH AT ALA MOANA SHOPPING CENTER IN HONOLULU. *Hawaii Med. J., 31(2):104-113, March/April 1972. 31 refs.*

In Nov. 1970 concentrations of carbon monoxide and suspended particulate matter were measured at the Ala Moana shopping center in Honolulu. During the evening peak shopping hours, automobile exhaust raised the pollution level to 47 ppm CO and 280 micrograms/cu m of suspended particulates. The potential health effects from these high levels of pollution are examined, including the toxicity of aerosol inhalation, respiratory diseases, carcinogenic effects, CO poisoning, carboxyhemoglobin rates, synergistic potentials, morbidity, and mortality. Specific recommendations for pollution abatement in the area are presented. (Author abstract modified)

25694 **APTIC NO. 47216**

Fujitani, Yoshiyasu

AIR POLLUTION SURVEY IN NAGOYA BY TOYOTA PROJECT. *(Nagoya chiku ni okeru taiki osen jittai chosa). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 579-587. (Oct. 17-19.)*

Gas samples were collected simultaneously at 104 spots in the vicinity of two crossroads in Nagoya to ascertain the relationship between carbon monoxide and sulfur dioxide concentrations and traffic density. To determine the relationship between CO and SO2 concentrations and traffic volume over the entire area of Nagoya, gas samples were taken at 200 sites in the city simultaneously. Continuous measurements were carried out since August 1971 at two monitoring stations and two mobile laboratories on SO2, CO, nitric oxide, nitrogen dioxide, hydrocarbons, oxidant, and particulates. Wind direction, wind speed, temperature, humidity, solar radiation, and rainfall were also measured, in addition to traffic volume and visibility.

25695 APTIC NO. 47099

Masek, Vaclav

NEW FINDINGS CONCERNING THE PROPERTIES OF FLY DUST FROM COKING PLANTS. PART IV. HARD COAL TAR DISTILLATION PLANTS. *(Neue Erkenntnisse ueber die Eigenschaften des Flugstaubes aus der Kokerei. Teil IV: Steinkohlenteerdestillationsanlagen). Text in German. Zbl. Arbeitsmed., 22(11):332-337, 1972. 11 refs. Part I. Ibid, 22(2):38-47. Part II. Ibid, 22(3):69-74. Part III. 22(9):276-281.*

In three tar distillation plants the benzo(3,4)pyrene concentration in the fly dust was determined. Samples were taken at 20 different points on 566 impregnated Schleicher-Schuell filters with a diameter of 11 cm. The benzo(3,4)pyrene concentration was determined by chromatography. In all samples benzo(3,4)pyrene was found; the largest quantities in the samples were taken during charging and emptying of the tanks with and from hot pitch. The benzo(3,4)pyrene was found primarily in the fly dust fractions with diameters up to 5 micron.

25696 APTIC NO. 47289

Ono, Nagataro

THE PRESENT STATUS OF DUST COLLECTORS AND THE INSPECTION SYSTEM. *(Shujin sochi no genkyo to kensa seido ni tsuite). Text in Japanese. Association for the Prevention of Industrial Public Nuisance (Japan), Proc. Assoc. Prev. Ind. Pub. Nuisance, Symp., 2nd, Japan, 1972, p. 1-7. (Oct. 3-7.)*

According to the records of suspended particulates taken in 41 cities at 96 monitoring stations, only 7% of the total check points had consistent daily averages of less than 0.1 mg/cu m. However, the yearly averages in large cities have decreased, after the peak in 1968. The 1968 indexes in Tokyo, Osaka, and Kawasaki were 0.20 mg, 0.277 mg, and 0.42 mg/N cu m respectively. In 1970, they decreased to 0.157, 0.133, and 0.135 mg/N cu m respectively. The highest hourly indexes for 1970 appeared in Ube, at 7.47 mg/N cu m and in Tokyo at 6.66 mg/N cu m. These figures surpass by far the 1.5 mg/N cu m of London in 1952 when many deaths occurred. Various problems of dust collectors are discussed. In general, the user s lack of knowledge of the condition of dusts and of the capacity of the apparatus cause unsatisfactory results. Venturi scrubbers can capture up to 95% of ordinary size vapor particles, but it is necessary to capture small particles of about 4 micron in order to eliminate mist. Bag filters often deteriorate from the clogging of filter material, especially when treating small particles with high electric resistance. Electrostatic precipitators also have problems with microparticles with high electric resistance. Performances with various size dusts with various resistances are discussed.

25697 APTIC NO. 47181

Renoux, A., G. Tymen, and G. Madelaine

COMPARISON BETWEEN THE WEIGHT AND RADIOACTIVITY OF CASCADE IMPACTOR-CAPTURED ATMOSPHERIC DUSTS. *(Comparaison entre le poids et la radioactivite des poussieres atmospheriques captees par un cascade-impactor). Text in French. Atmos. Environ., 6(10):765-773, Oct. 1972. 26 refs.*

A cascade impactor was used to study mass distribution and radioactivity of atmospheric aerosols in lightly polluted sea air (dust mean weight 110 micrograms/cu m). Twenty percent of the full mass was distributed on particles with radii smaller than 1 micron, 50% on particles up to 2.5 micron, and 70% on aerosols smaller than 4 micron. In addition, 20% of the alpha radioactivity due to radon decay products was found on particles with radii larger than 0.25 micron. This is not in accordance with the distribution law dN/dR equals CR(-3). Alpha activity fixed on large aerosol particles and dust concentration in the atmosphere are compared.

25698 APTIC NO. 47100

Tokyo Metropolitan Government (Japan), Nerima District Dept. of Environmental Protection

INVESTIGATION ON ENVIRONMENTAL POLLUTION BY AUTOMOBILE EXHAUST GAS: 1. POLLUTION BY CARBON MONOXIDE 1971 DATA. *(Jidosha haiki gasu kankyo osen chosa, daiippo, issanka tanso ni yoru osen ni tsuite, deta-hen, Showa 46-nendo bun). Text in Japanese. 84p., 1971.*

Investigations of environmental pollution by automobile exhaust gas in the Nerima District of Tokyo were conducted in various parts of the district between May 1971 and March 1972. The 48-hour averages at three locations in the Sakuradai area in June 1971 were 6.54, 9.81, and 7.81 ppm; the 48 hour averages at the same locations in Dec. 1971 were 9.15, 10.59, and 7.23 ppm. High peaks for carbon monoxide concentrations in daily patterns seemed to appear once in the morning between 8 and 10 am and once again in the evening either around 6 to 8 pm or 10 pm to midnight. Some heavy traffic areas showed extremely high concentrations of CO.

25699 APTIC NO. 47267

Watanabe, Ikuo, Toshiichi Okita, and Shigeru Seino

ANALYSIS OF HYDROCARBONS IN AMBIENT AIR -- II.-DETERMINATION OF LIGHT HYDROCARBONS IN THE AREA OF PETROLEUM CHEMICAL COMPLEXES. *(Taikichu tanka suiso no bunseki -- Dainiho. Sekiyu conbinato chiku ni okeru teikyu tanka suiso no bunseki). Text in Japanese. Koshu Eiseiin Kenkyu Hokoku (Bulletin of the Institute of Public Health), 20(2):107-118, 1971. 3 refs.*

Light hydrocarbon concentrations were measured in the vicinity of a petrochemical complex at an industrial area. The samples were analyzed by gas chromatography using a flame ionization detector. Acetylene and propylene were relatively rich in the atmosphere of the plant as compared to the air of Tokyo. The range of variations in hydrocarbon concentrations in the area was great, and most exhaust gases contained relatively large amounts of acetylenes. Waste water was also a source of light hydrocarbon emissions.

ATMOSPHERIC INTERACTION

1972

25700 APTIC NO. 47230

Halpern, P., H. H. Wang, L. J. Shieh, and B. H. Armstrong

AIR QUALITY MODELING FOR EPISODE CONDITIONS IN NEW YORK CITY. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 629-641. 4 refs. (Oct. 17-19.)*

An experimental multisource air pollution diffusion model based on the Gaussian plume formulation was used to simulate the sulfur dioxide concentration distribution for the New York metropolitan area for January 10-12, 1971. During this period the SO2 air quality in the New York metropolitan area reached episode levels. The model is capable of incorporating point and area sources, time and space dependence of source strengths, and time and space dependence of meteorological variables. (Author introduction modified)

25701 APTIC NO. 47244

Kita, Takaaki

A DOUBT ABOUT THE SO-CALLED NEW-TYPE PHOTOCHEMICAL SMOG. *(Iwayuru shingata kokagaku sumoggu ni taisuru gimon). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 427-440. 5 refs. (Oct. 17-19.)*

Cases reported as due to photochemical smog in Tokyo and Osaka are questioned since they occurred frequently on cloudy days and because of several other discrepancies between these cases and those seen in Los Angeles. It is suggested that the cases reported as photochemical smog were all due to short-period, high- concentration exposures--fumigation, from wide spread, small stack plumes. Winds, cloudiness, oxidant concentration, and other factors described.

25702 **APTIC NO. 47232**

Kondo, Jiro

ON THE MATHEMATICAL MODELS OF AIR POLLUTION. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 1-17. (Oct. 17-19.)*

Weather, city layout topography, chemical reactions in the atmosphere, and various other factors must be considered with regard to the diffusion of pollutants. The aim of mathematical modeling is to establish a qualitative relationship between these factors and thus predict the degree of pollution and consequently find an optimum policy for its control. The state of art for the modeling of air pollution is evaluated, and the application of systems engineering and operations research to the problem of pollution is emphasized. The diffusion of inert gases, photochemical reactions, dimensional plume analysis, the Gaussian plume model, the Gifford-Hana model, diffusion models, the photochemical smog model, and the stochastic model are discussed.

25703 **APTIC NO. 47209**

Morita, Yasuhiro, Haruji Ishikawa, and Masahiro Kanada

ON THE RECENT MEASUREMENTS OF ATMOSPHERIC ION DENSITY FROM THE GROUND TO THE STRATOSPHERE. *J. Meteorol. Soc. Japan, 50(4):355-361, Aug. 1972. 22 refs.*

Balloon measurements of negative small ion density in the atmosphere from the ground to 30 km were made in Sept. 1970. Vertical profiles of the negative small ion density were obtained for daytime and nighttime conditions. The density changed at certain altitudes corresponding to temperature inversions in both daytime and nighttime. The day and night profiles agreed fairly well with each other, except that the two daytime ion density maxima were 2 km higher than the nighttime peak and a second increase in the ion density was observed at 30 km during the nighttime. All profiles showed a remarkable decrease of ion density in the altitudes between 16 and 25 km. Rapid changes in ion density were observed below 3 km. The profiles were compared with those determined from the data of ionization measurements in the atmosphere, assuming ionization equilibrium with small ions. The disagreement between observed and calculated profiles in the troposphere may be attributed to the influence of atmospheric aerosols. In the stratosphere, the disagreement cannot be attributed only to the influence of atmospheric aerosols given by Junge. The measurements at a constant level of about 30 km showed a decreasing tendency toward the dawn. (Author abstract modified)

25704 **APTIC NO. 47215**

Nakano, Nichio

ESTIMATION OF THE CONTRIBUTION RATE OF INDIVIDUAL EMISSION SOURCE TO AIR POLLUTION BY THE ATMOSPHERIC DIFFUSION COMPUTATION. *(Taiki osen kiyoritsu no suitei). Text in Japanese. Japanese Union of Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 567-577. 7 refs. (Oct. 17-19.)*

The sulfur dioxide concentration in the northwestern part of Osaka, where many small and medium size factories stand close together, together with the large emission sources of the industrial area of the adjacent city of Amagasaki, make this area one of the most polluted in Japan. With the goal of decreasing the SO2 concentrations in the area to the level of the National Air Quality Standards (less than 0.05 ppm mean annual value), the city authorities of Osaka have been taking various measures such as the encouragement of consumption of fuel oil with low sulfur levels. Recently, an emission inventory was made of the contribution of the various sources to emissions in this area. A Gaussian type diffusion equation was utilized for the computation, and effective stack height was also determined.

25705 **APTIC NO. 47229**

Sakuraba, Shin ichi, M. Moriguchi, and I. Yamaji

THE ELEVATED-SOURCE DIFFUSION AT COASTAL REGIONS. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 589-600. 2 refs. (Oct. 17-19.)*

Field experiments of elevated-source diffusion made at coastal regions in Japan were evaluated, with particular attention to vertical concentration profile measurements. A remarkable rise of tracer cloud sometimes occurs over a hill or a ridge, which makes the surface concentration pattern much different from one typical to elevated-source diffusion. The sea breeze, usually stably stratified over the sea during the day in warm seasons, is subject to heating from below when inland, while the convective layer develops upwards and the diffusion rate changes from the oversea to the overland one. This is well reflected in the change of Pasquill stability in the vertical spread of concentration. When the source height is below the base of the inversion or stable layer, two peaks are found in the vertical concentration profile. One corresponds to the source height and the other coincides with the base of the inversion or stable layer. This makes the surface concentration decrease. (Author abstract modified)

25706 **APTIC NO. 47270**

Schumann, G.

RADON ISOTOPES AND DAUGHTERS IN THE ATMOSPHERE. *Arch. Meteorol. Geophys. Bioklimatol., Ser. A (Vienna), 21(4):149-170, 1972. 70 refs.*

Research on atmospheric radon(222), and radon(220), and their decay products is discussed. Knowledge of the behavior of radon in the marine environment has increased considerably, especially with respect to emanations from the air-sea interface. Questions of the disequilibrium between radon isotopes and daughters are still rather involved. Investigations on the natural radioactive aerosol have also made progress. The fixation of radioactive atoms and ions to particulates in the atmosphere is important in research on aerosols and atmospheric pollution. Radon(220) can be used as a tracer for atmospheric diffusion near the ground. Radioactive aerosols may also be used as tracers for removal of particulate matter from the atmosphere. (Author summary modified)

25707 **APTIC NO. 47246**

Suzuki, Shin

CURRENT PROBLEMS OF PHOTOCHEMICAL SMOG IN JAPAN. *(Nihon ni okeru kokagaku sumoggu ni kansuru saikin no shomondai). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 377-418. 3 refs. (Oct. 17-19.)*

Photochemical smog and its related problems in Japan are reviewed. The Rissyo high school episode of 1970, countermeasures of the Federal and local governments, monitoring systems, and the present situation with regard to concentrations of oxidants and related substances are discussed, in addition to the research projects initiated by the government. Characteristics of Tokyo smog are described in detail from a scientific point of view. Effects of meteorological conditions (such as winds, humidity, pressure, inversions, sea breeze, and temperature) on the occurrence of Tokyo smog are com-

pared with those of Los Angeles smog, as well as the daily variation of concentrations of oxidant and the other contaminants suspected to have a relation to photochemical smog phenomena. Studies on ozone, peroxyacetyl nitrate, nitrogen dioxide, HCHO, hydrocarbons, sulfur dioxide, and aerosols are cited.

25708 **APTIC NO. 47213**

Yaglom, A. M.

ON TURBULENT DIFFUSION IN THE ATMOSPHERIC SURFACE LAYER. *(O turbulentnoy diffuzii v prizyemnom sloye atmosfery). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 8(6):579-593, 1972. 27 refs.*

The similarity laws of turbulent diffusion from ground sources in a neutrally stratified boundary layer contain several indeterminate numerical parameters. Some of these parameters were evaluated by Ellison and Chatwin with the aid of a simple parabolic diffusion equation. This equation is replaced with a more refined equation of diffusion with a finite velocity or with a parabolic equation which takes into account the nondiagonal form of the eddy-duffusivity tensor. The numerical parameters of turbulent diffusion in a free convection sublayer of a strongly unstable atmospheric surface layer are evaluated with the original and refined parabolic diffusion equations.

25709 **APTIC NO. 47231**

Yokoyama, Osayuki

PREDICTION OF AIR POLLUTION BY WIND TUNNEL AND FIELD DIFFUSION EXPERIMENT. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 601-627. 13 refs. (Oct. 17-19.)*

Theoretical and experimental investigations of air pollution control procedures involve predictions of pollutant concentrations. Field surveys of the diffusion of a pollutant and, in particular, sulfur dioxide, have been carried out in newly developing industrial and urban areas in Japan, together with wind tunnel diffusion experiments. The field surveys which comprise tracer experiments gave the actual state of pollutant diffusion and also a standard condition which can be used as a formal administrative guideline for pollution control. However, effects of topography could be taken into account by field tracer experiments alone so that wind tunnel experiments were used simultaneously with the field experiments for obtaining more precise predictions. The methods used in the field and wind tunnel experiments are described, as well as the present status of the experiments which have been conducted.

1971

25710 **APTIC NO. 47142**

Benarie, M.

TEST OF SYNOPTIC CRITERIA OF POLLUTION BY STRONG ACIDITY IN THE ROUEN REGION. *(Essai de prevision synoptique de la pollution par l acidite forte dans la region Rouennaise). Text in French. Atmos. Environ., 5(5):313-326, May 1971. 18 refs.*

Two simple synoptic criteria are defined for the prediction of high sulfur dioxide concentrations in the Rouen region: a period of 24 hours during which the mean wind velocity was less than 3.0 m/sec; a forecast of a similar situation for tomorrow. The proposed empirical method permits pollution forecasts in periods of calm weather. Advantages of this method as compared to the diffusion models and empirical correlation formulas are indicated. (Author abstract modified)

25711 **APTIC NO. 47146**

Phillips, David T. and Philip J. Wyatt

OPTICAL STUDIES OF AUTOMOTIVE AND NATURAL HAZES: SCATTERING FROM SINGLE PARTICLES. (FINAL REPORT). *Science Spectrum, Inc., Santa Barbara, Calif., Air Pollution Control Office Contract CPA-70-171, Coordinating Research Council CRC-APRAC Proj. CAPA 6-68, EPA-R2-72-098, 45p., Feb. 1971. 4 refs.*

NTIS: PB 202361

The use of single particle light scattering measurements to determine the origin of atmospheric hazes was investigated by measurement of laboratory aerosols, field samples, and computer analysis of the light scattering data. Analytical methods were developed for the determination of the refractive index. Analysis of scattering curves determined measurable differences in refractive index between a photochemical pine tree aerosol and a photochemical petroleum aerosol. For particles less than 500 nm in diameter, only the measurement of absolute scattering intensity at two angles was required. Distinctive non-spherical and absorbing particles were observed in automotive exhaust and atmospheric samples. Instrument design and operation, experimental procedures, analysis, and test results are reviewed. (Author abstract modified)

1970

25712 **APTIC NO. 47136**

Niemeyer, L. E., R. A. McCormick, and J. H. Ludwig

ENVIRONMENTAL ASPECTS OF POWER PLANTS. *Preprint, International Atomic Energy Agency, Vienna (Austria), 18p., 1970. 25 refs. (Presented at the Symposium on Environmental Aspects of Nuclear Power Stations, New York, Aug. 10-14, 1970.)*

The second largest cause of air pollution in the U. S. is emission of sulfur oxides from coal and oil-fired electric generating plants. Since a threefold growth of fossil-fueled electric power plants is expected over the next 30 years, the National Air Pollution Control Administration has initiated a comprehensive program to deal with the environmental aspects of power plant effluents. One of the major aspects affecting these effluents is the dispersion and diffusion of the pollutants. Taller stacks have been built to disperse pollutants; as unit size increases and stacks become taller, the plume dispersion model associated with maximum surface concentrations changes. Models must consider inversions, cloudiness, solar radiation, and topographic effects. Sulfur dioxide can be transformed in the atmosphere by photochemical and catalytic oxidation into sulfate particulates. Humidity can affect these transformations. The SO2 can also be oxidized to sulfuric acid or acid salt, and precipitation scavenging can remove the gases and particulates. Cooling tower systems emit large amounts of water vapor which can increase atmospheric moisture and modify the climate in the vicinity of generating stations by reinforcing the formation of cumulus clouds. An increase of atmospheric aerosols may also cause climatic changes such as changes in turbidity and the global albedo value and a decrease in the earth s temperature. An increase in sulfur could also increase average cloud cover and height by rendering the clouds more stable, which would increase global albedo. Heat, moisture, and carbon dioxide produced by power plants could cause other weather modifications. To evaluate power plant sites, meteorological-climatological factors, topography, scavenging, and plume behavior must be considered.

BASIC SCIENCE AND TECHNOLOGY

1972

25713 **APTIC NO. 47169**

Beer, J. M.

PAPER 1. RECENT ADVANCES IN THE TECHNOLOGY OF FURNACE FLAMES. *J. Inst. Fuel, 45(377):370-382, July 1972. 100 refs. (Presented at the Institute of Fuel, National Convention, 1st, Sheffield, England, June 5-8, 1972.)*

Methods of predicting combustion length and furnace performance are reviewed. For turbulent diffusion flames, the usual industrial flame type, the flow and mixing patterns in the combustor determine the progress of combustion. Methods of prediction based on laws of similarity of turbulent jets, concepts of stirred-plug flow reactor theory, and on detailed analytical description of the flow pattern using exchange coefficients based on turbulent flow hypotheses are discussed. For the combustion of droplets and particles, the rates of the heterogeneous reaction and spatial and size distribution have to be taken into account for predicting the progress of combustion. The emission of pollutants such as hydrocarbons, soots, and nitric oxide can be reduced by controlling the concentration and temperature history within the combustor. Methods of calculation are presented for the prediction of radiative heat from the flame to heat sinks, in the order of increasing sophistication: well-stirred model, long furnace model, multi-flux methods, and the zone method of analysis. (Author abstract)

25714 **APTIC NO. 47227**

Calvert, Jack G., Kenneth L. Demerjian, and J. Alistair Kerr

THE MECHANISMS OF PHOTOCHEMICAL SMOG FORMATION. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 465-504. 36 refs. (Oct. 17-19.)*

The photochemistry of sunlight irradiated mixtures of clean air was considered. The effects of added nitric oxide and nitrogen dioxide impurities on the mechanism of the chemical reactions in a sunlight irradiated clean atmosphere were then determined. Effects of added carbon monoxide, aldehydes, and hydrocarbons on the chemistry of sunlight irradiated nitric oxide and nitrogen dioxide containing atmospheres were discussed. A computer simulation of the chemistry of a simple analogue to the sunlight irradiated, automobile exhaust polluted atmospheres was described.

25715 **APTIC NO. 47171**

Chutjian, Ara and Gerald A. Segal

THEORETICAL INTERPRETATION OF THE OPTICAL AND ELECTRON SCATTERING SPECTRA OF POLYATOMIC MOLECULES. III. N2O AND THE DISCOVERY OF RESONANT PHENOMENA IN THE B REGION AT 6.8 EV. *J. Chem. Phys., 57(8):3069-3082, Oct. 15, 1972. 61 refs.*

Energies and parts of potential surfaces are calculated for the first 11 excited electronic states of nitrous oxide; the states within 10 electron volts of the ground state. The assignment of the energies and symmetries of these states which is carried out with the aid of semiempirical INDO calculations, is shown to be consistent with all available optical absorption spectra, electron scattering data, and with photolysis and photosensitization experiments. The weak, diffuse vibrational bands in the 6.8 eV B region have been interpreted as resonant interaction between the continuum levels of the 1 1(pi) state and bound vibrational levels of the underlying 1 sigma (-) state. The mixing is electronically allowed through bending in the excited states. Supporting experimental and theoretical evidence for this assignment is given, and experiments are suggested to confirm several of the other assignments made. (Author abstract)

25716 **APTIC NO. 47204**

El Golli, S., J. Bricard, P. Y. Turpin, and G. Armaud

STUDYING THE EVAPORATION OF VOLATILE LIQUID DROPLETS SUSPENDED IN TURBULENT FLOW. *(Etude de l evaporation de gouttelettes liquides volatiles en suspension dans un ecoulement turbulent). Text in French. Aerosol Sci., 3(4):255-274, July 1972. 13 refs.*

The evaporation of volatile liquid droplets suspended in a turbulent gas flow was studied by means of a photoelectric method. The initial radius of the droplets generated by a pneumatic atomizer was 8 micron with a relative humidity ranging from 35 to 95%. The change of surface area of evaporating droplets was a linear function of time. The molecular diffusion coefficient of Maxwells law is still applicable for droplets evaporating in a turbulent air flow. The measured rate of evaporation of twice-distilled water is higher than the rate determined by Maxwell s equation. The rate of evaporation of tap water droplets, especially of very small dimensions, is lower than that of twice-distilled water droplets, which is due to the evaporation-retarding effect of dissolved salts and suspended impurities, the difference of the evaporation rates being about 15%.

25717 **APTIC NO. 47195**

Goldberg, Samuel A. and Murray Jacobson

BUREAU OF MINES PROCEDURE FOR EVALUATING QUARTZ CONTENT OF RESPIRABLE COAL MINE DUST. *Bureau of Mines Information Circ., 8545:1-10, 1972. 7 refs.*

The Bureau of Mines laboratory procedure for determining the percent quartz in respirable coal mine dust samples is described. The infrared technique used for analysis is faster than wet chemical methods, but still needs improvement. The feasibility of using infrared spectroscopy for analysis of samples without removing them from the filter and of using X-ray diffraction analysis is under investigation.

25718 **APTIC NO. 47179**

Hall, G. K. and C. H. B. Mee

THE ADSORPTION OF CARBON MONOXIDE ON IRON, COBALT, AND MANGANESE. *Phys. Status Solidi, 12(2):509-515, 1972. 20 refs.*

Polycrystalline films of iron, cobalt, and manganese were evaporated at pressures of less than 10 to the minus 9th power torr onto fused silica substrates. Changes in work function as carbon monoxide was adsorbed on the films at room temperature were followed by a photoelectric technique. The curves of the change in work function versus exposure for both iron and cobalt showed an increase to saturation values of work function 0.13 eV for iron and 0.15 eV for cobalt. Any change in the work function of manganese was less than 0.01 eV. The results can be explained using a simple dipole theory, allowing for depolarization at high coverages. (Author abstract)

25719 **APTIC NO. 47257**

Hayakawa, Kazuya, Ryoji Masada, Horoaki Shimizu, and Toshiharu Okazaki

STUDIES ON AIR PURIFYING CHAMBER. *(Kuki seijo shitsu no kansuru kenkyu). Text in Japanese. Kuki Chowa Eisei Kogaku (J. Japan Soc. Heating, Air-Conditioning Sanitary Engrs.), 46(9):833-844, Sept. 1972. 13 refs.*

A universal non-stratified current, air cleaning chamber model was successfully constructed. This was designed to give satisfactory efficiency and wide applicability. The measurements of current distribution and micro-particle concentration were examined at different outlets, and the factors influencing

the cleanliness of the chamber were examined. The air was led into the chamber through a prefilter, middle filter, and a high efficiency particle filter (HEPA). The quantity of the air supply was controlled by five dampers. After various tests, dusts were most effectively supplied by the use of a compresser and atomized lubricant. The air passing through the entrance orifices went through a membrane filter, which eliminated particles larger than 0.5 micron. At the entrance of the compressor, the air was mixed with oil and sent into a rotor; it was stirred and atomized mechanically. Then the air went through an oil elimination muffler which captured particles larger than 1 micron. The pollutant quantity was controlled by an adjustment cock. Four dispersion apparatus were installed in the chamber. The suspended particulate concentration was measured by a light scattering dust counter. Detailed mathematical analyses of the resulting data are presented.

25720 **APTIC NO. 47182**

Kobayashi, Masayoshi and Haruo Kobayashi

APPLICATION OF TRANSIENT RESPONSE METHOD TO THE STUDY OF HETEROGENEOUS CATALYSIS. III. SIMULATION OF CARBON MONOXIDE OXIDATION UNDER AN UNSTEADY STATE. *J. Catalysis, 27(1):114-119, Oct. 1972. 12 refs.*

The reaction mechanisms of a model for carbon monoxide oxidation to carbon dioxide over manganese dioxide, proposed previously from response experiments, were analyzed kinetically by computer simulation of unsteady state reaction data. The rate constants of all elementary steps were successfully determined by the non-linear parameter optimization technique. The kinetic results were consistent with the previous experimental findings, which substantiates the potential use of the transient response method in studies of heterogeneous catalysis. (Author abstract modified)

25721 **APTIC NO. 47174**

Lin, M. J., D. P. Johnson, and J. H. Lunsford

THE EPR SPECTRA OF COS(-) AND CS2(-)ON MAGNESIUM OXIDE. *Chem. Phys. Letters (Amsterdam), 15(3):412-413, Aug. 15, 1972. 8 refs.*

The electron paramagnetic resonance (EPR)spectra of carbonyl sulfide (-) and carbon disulfide (-) on magnesium oxide were observed following reaction of the neutral molecules with electrons trapped at the surface. The spectra were characterized by g (sub zz) equals 2.0022, g (sub xx) equals 2.0049, and g (sub yy) equals 1.986 for COS(-) and g (sub zz) equals 1.9999, g (sub xx) equals 2.0078, and g (sub yy) equals 1.963 for CS2(-). Both ions are much less stable than the previously detected carbon dioxide (-) radical on MgO. (Author abstract modified)

25722 **APTIC NO. 472**

Pitts, James N., Jr. and Gerald E. Grimstone

PHOTOCHEMICAL SMOG. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 41-60. 41 refs. (Oct. 17-19.)*

The prime concern of those formulating control measures to combat air pollution must be the health and welfare of the general population. A schematic model of the system with which one is concerned in photochemical air pollution studies is shown; the same figure also illustrates the essential importance of the feedback loop which exists from legislation to the control of emission sources. The formation of photochemical smog is considered, and mechanisms of atmospheric oxidation are reviewed. London-type smog is compared with Los Angeles-type smog. The present situation in southern California is discussed. The role of aldehydes in photochemical smog is described, as well as the operation of laboratory smog chambers, heterogeneous reactions in the atmosphere, and uncertainties in air quality standards versus control costs. Benefits of international collaboration and societal options in smog control are mentioned. Proposed new Federal and California air quality standards are compared for sulfur oxides, particulates, carbon monoxide, oxidants, nitrogen dioxide, and hydrocarbons.

25723 **APTIC NO. 47263**

Scheidweiler, Andreas

THE DETECTION OF THERMALLY PRODUCED IONS WITH THE AID OF AN IONIZATION CHAMBER UNDER THE INFLUENCE OF AN AEROSOL. *(Der Nachweis thermisch erzeugter Ionen mit Hilfe einer Ionisationskammer unter dem Einfluss eines Aerosols). Text in German. Staub, Reinhaltung Luft, 32(11):447-450, Nov. 1972. 2 refs.*

A measuring procedure is described with the objective of proving the existance of thermally produced ions or so-called flame ions, outside their place of origin. An ionization chamber was used which permitted the unimpaired flow of air into the chamber. The voltage was so high that the entering ions were immediately drawn off by the electrodes. First combustion processes were triggered which did not produce aerosols. Then a mixture of alcohol and benzene was ignited with benzene as the aerosol producer. The aerosol density could be optionally varied by selecting a certain mixing ratio. Liquid and solid fuels were tested, such as dry wood which produces an aerosol in the submicron range. Flame ions could be quantitatively determined by an ionization chamber as long as no aerosols were produced. Small concentrations of aerosols already exerted a negative influence on the measurement results, which was true also for invisible aerosols with particle sizes of less than 0.3 micron.

25724 **APTIC NO. 47190**

Thomas, Jess

AEROSOL PROPERTIES. *In: HASL Procedures Manual. Atomic Energy Commission, New York, Health and Safety Lab. Rept. TID-4500, HASL-300, p. 02-01 to 02-05, 1972. 5 refs.*

NTIS: HASL-300

The fundamental properties of aerosols with relation to the performance of filters and to the loss of particles in sampling lines are reviewed. The specific processes of diffusion, gravity settling, and evaporation are examined. The diffusion movement of aerosols is inversely related to particle size. The rate of settling of aerosol particles, defined by Stokes law, is very nearly proportional to the square of the particle diameter for particles over 1 micron in diameter. The rate of evaporation is a function of the vapor pressure of the substance and the particle size. Aerosol behavior in sampling lines and filters is investigated.

25725 **APTIC NO. 47295**

Truhlar, Donald G., Sandor Trajmar, and Walter Williams

ELECTRON SCATTERING BY MOLECULES WITH AND WITHOUT VIRBRATIONAL EXCITATION. IV. ELASTIC SCATTERING AND EXCITATION OF THE FIRST VIBRATIONAL LEVEL FOR N2 AND CO AT 20 EV. *J. Chem. Phys., 57(8):3250-3259, Oct. 15, 1972. 64 refs. (Presented in part at the American Chemical Society, Central Regional Meeting, 4th, Pittsburgh, Pa., May 5, 1972 and other meetings.)*

Normalized experimental differential cross sections for scattering angles in the range of 20-85 deg are presented for elastic scattering and excitation of the fundamental vibration of nitrogen and carbon monoxide by electrons with an impact energy of 20 eV. The integral cross sections are estimated from three of the four differential cross sections. The cross sections for nitrogen were in good agreement with those of Pavlovic, et al. The elastic scattering cross sections are compared to the predictions of the polarized Born approximation using five model potentials (including polarization) which have been previously proposed for N2 or CO. The model of Craw-

ford and Dalgarno is in good agreement with experimental data, and the model of Sampson and Mjolsness can be put in good agreement by changing an empirical cutoff parameter by about 0.5a(sub 0). The vibrational excitation of N2 was dominated by resonance scattering, as originally suggested by Pavlovic. The vibrational excitation of CO also appears to be dominated by resonance scattering. The quantum mechanical calculations cannot account for the magnitude of the differential cross section in the 30-85 deg angle range or its angle dependence in the 20-85 deg angle range. An important nonresonance contribution to the vibrational excitation differential cross section at angles below 20 deg is predicted. (Author abstract modified)

25726 **APTIC NO. 47228**

Urone, Paul

PHOTOCHEMICAL AND THERMAL REACTIONS OF SULFUR DIOXIDE. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 505-519. 58 refs. (Oct. 17-19.)*

Selected sulfur dioxide photochemical and thermal reactions are examined. The presence of sulfur dioxide in air, in air with oxides of nitrogen, in air with hydrocarbons, and in air with oxides of nitrogen and hydrocarbons, is considered. The effect of water vapor is discussed. Sulfur dioxide and particulates and sulfur dioxide in solution are considered. The primary photochemical reaction of sulfur dioxide is, within limitations, principally through the excited triplet state. It may also rate in the ground as well as the excited state with the primary and secondary products of the photolysis of nitrogen oxides in the presence of a large variety of saturated, unsaturated, aromatic, and partially oxidized organic compounds. The thermal reactions of sulfur dioxide in a polluted atmosphere probably depend to a large extent upon the humidity and temperature of the air and the types of other pollutants present.

25727 **APTIC NO. 47170**

Van Brunt, R. J., F. W. Powell, R. G. Hirsch, and W. D. Whitehead

PHOTOIONIZATION OF N2, O2, NO, CO, and CO2 BY SOFT X RAYS. *J. Chem. Phys., 57(8):3120-3129, Oct. 15, 1972. 29 refs.*

The total and relative abundances of thermal energy ions produced by absorption of 0.28, 1.25, and 1.5 keV x rays in nitrogen, oxygen, nitric oxide, carbon monoxide, and carbon dioxide and the dissociative ionization cross sections at these energies were measured using a mass spectrometric technique. There was a significant change in the character of the ionization at the K-absorption edges of the atomic constituents. At these energies, dissociative ionization predominates for all the molecules accounting for over 95% of the ions formed at energies above the K edge. Quasi-stable, doubly charged molecular ions make a significant contribution to the thermal energy ions at energies above the K edge. Results for the total abundances of thermal singly and doubly charged molecular ions are compared with recent measurements by Carlson and Krause. (Author abstract)

25728 **APTIC NO. 47245**

Yanagihara, Shigeru

INFLUENTIAL FACTORS ON PHOTOCHEMICAL REACTION OF AUTOMOTIVE EXHAUST. *(Jidosha haiki no kokagaku hanno ni eikyo suru shoyoso). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 441-459. (Oct. 17-19.)*

Automotive exhaust gas and standard hydrocarbon irradiation experiments were conducted in order to study the reaction of these elements to solar irradiation. The analyzers used were a nondispersive infrared analyzer for carbon monoxide, a flame ionization detector for hydrocarbons, and a Beckman K-72 analyzer for sulfur dioxide, nitrogen dioxide, nitric oxide, and oxidant. The reaction processes, the influences of HC/NOx ratio, the influences of irradiation intensity, the influences of temperature, and the influences of humidity were studied. When HC/NOx is greater, the speed of reaction increases. The reaction speed is very much influenced by HC concentration and activity; the maximum oxidant index is very much influenced by the initial NOx concentration when HC activity is high. The intensity of ultraviolet irradiation has an approximately proportionate influence on the reaction speed; the influences of the temperature is great when the activity of HC is relatively low; the reaction is relatively fast when the humidity is between 40 and 70%. HC reaction is great when the single element belongs to the olefin, relatively small when it belongs to the alkylbenzene group, and even smaller when it belongs to the paraffin group. The compositions of aldehydes and peroxyacetyl nitrate are directly influenced by the compositions of HC.

1971

25729 **APTIC NO. 47198**

Hailey, D. M., H. M. Barnes, C. Woodward, and J. W. Robinson

A CATALOG OF LASER-STIMULATED INFRARED EMISSION SPECTRA. *Anal. Chim. Acta, 56(6):161-174, Sept. 1971. 6 refs.*

A catalog was compiled of laser-stimulated infrared emission spectra from 36 compounds. Spectra were correlated with appropriate bond vibrations. The variety of compounds detected was an indication of the wide applicability of this technique to analytical problems. Radiation was provided by a Perkin Elmer Model 6200 molecular gas laser, and the spectrometer was a Beckman Model IR-10, modified and operated with fully open slits. The compounds included hexanes, pentenes, butadienes, toluenes, thiophene, pyridines, amines, alcohols, ketones, organic nitrogen compounds, tetraethyl lead, carbon disulfide, nitrogen oxides, ammonia, sulfur dioxide, and halogenated hydrocarbons.

25730 **APTIC NO. 47203**

Kessler, T., A. G. Sharkey, Jr., and R. A. Friedel

SPARK-SOURCE MASS SPECTROMETER INVESTIGATION OF COAL PARTICLES AND COAL ASH. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, Respirable Dust Research Program. TPR-42, 17p., Sept. 1971. 7 refs.*

Spark-source mass spectrometry was used to determine the amounts of minor and trace elements in coal particles of various sizes, including the respirable range (less than 5 micron). Fifty-six elements, ranging in concentration within 0.1-5000 ppm wt, were determined. The presence of organic material did not interfere with the analysis. The relationship between particle size and concentrations of the trace elements was examined. For one sample of Pittsburgh seam coal, the only elements showing a change in concentration with particle size were beryllium, uranium, and lead, with Be and U the lowest in the smallest particle size (less than 1.0 micron) and Pb the highest. In one sample of Upper Freeport seam hvab coal, Be and U concentrations were lower in particles less than 5 micron. Concentrations of calcium and silicon were lower in a respirable dust than in a coal fraction with the same particle sizes in an Upper Freeport seam mine sample. (Author summary modified)

25731 **APTIC NO. 47132**

Kwok, Clyde C. K., Ngo Dinh Thinh, and Sui Lin

AN INVESTIGATION OF CONFINED VORTEX FLOW PHENOMENA. *Preprint, American Society of Mechanical Engineers, New York, 8p., 1971. (Presented at the American Society of Mechanical Engineers, Gas Turbine*

and Fluids Engineering, Conference and Products Show, San Francisco, Calif., March 26-30, 1972, Paper 72-Flcs-3.)

The swirling, incompressible flow within a short vortex chamber of aspect ratio 1/9, defined by the ratio of chamber height to chamber diameter, was investigated analytically. The theoretical analysis consists of the adaptation of Wormley s analytical technique and the extension of the method to include the apparent viscosity factor. The Runge-Kutta method is used to solve numerically the set of differential equations. The analytical results are compared with those of the experimental investigations conducted by Savino and Keshock. The analytical results prove that the values of apparent viscosity seriously affect the velocity profiles within the vortex chamber. The apparent viscosity varied from 7000 mu at the vortex chamber periphery to 4900 mu at the orifice exit plane, where mu is the operating fluid viscosity. An empirical expression for the apparent viscosity is mu (sub a) equals K (sub 1) times the tangential velocity to the n power plus K (sub 2), where n, K (sub 1), and K (sub 2) are constants equalling -1/3, 0.01, and 0.0005, respectively, for this investigation. (Author abstract)

25732 **APTIC NO. 47201**

Schlesinger, M. D. and Hyman Schultz

ANALYSIS FOR MERCURY IN COAL. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, Managing Coal Wastes and Pollution Program TPR-43, 6p., Sept. 1971. 7 refs.*

The mercury content of coal was analyzed by the dithizone method, flameless atomic absorption, and neutron activation. The average mercury content was determined at 0.2 ppm, with some western coals containing as little as 0.05 ppm. (Author abstract modified)

EFFECTS-HUMAN HEALTH

1972

25733 **APTIC NO. 47164**

Kanagawa Prefectural Government (Japan) Pollution Control Bureau

STATE OF PHOTOCHEMICAL SMOG IN KANAGAWA PREFECTURE (1972 PROGRESS REPORT). *(Kanagawa-ken ni okeru kokagaku kogai no hassei jokyo ni tsuite. (Showa 47-nendo chukan hokoku)). Text in Japanese. Oct. 11, 1972. 10p.*

A total of 31 photochemical smog emergency warnings were issued between April and early October of this year in Kanagawa prefecture. This was an increase of more than three times the number of the total emergency warning issued last year. However, the degree of health impairment and the total number of people affected by the smog were much less serious. The total number of complaints was 1383, which was approximately 1/10 of 1971 reports of health impairment (13,183). The number of health damage cases were 16, and its ratio to the total number of warnings was 52%. Main symptoms of health impairment were irritated eyes, pain in the eyes, tears, throat pain, difficulty in breathing, headache, and coughing. Seventy percent of the total number of people affected were related with various levels of schools, and many of them were outside the school buildings or in open class rooms. The time of incidents was always between 10 am and 4:30 pm.

25734 **APTIC NO. 47158**

Braun, Daniel C., John A. Jurgiel, and Paul Gross

ESTABLISHING ENVIRONMENTAL CRITERIA: MEDICAL PERSPECTIVES. *Preprint, American Medical Assoc., Chicago, Ill., 5p., 1972. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Some aspects of the various kinds of pollution are mentioned, and physicians are urged to become involved in air pollution problems. Physicians must learn to evaluate realistically the long-term effects of pollutants at low levels. With this background the medical profession can meet its obligation to help in arriving at proper criteria for environmental controls, and maintaining the medical perspective. Basic pollutants, sources, and health effects are mentioned.

25735 **APTIC NO. 47160**

Carnow, Betram W. and Paul Meier

AIR POLLUTION AND LUNG CANCER. *Preprint, American Medical Assoc., Chicago, Ill., 53p., 1972. 39 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Evidence of the incidence of environmentally related lung cancer in humans is derived largely from epidemiologic studies in communities or population groups with demonstrably different levels of pollution. Four groups of studies are discussed. The first compares urban metropolitan populations with rural populations and examines the overall differences in lung cancer death rates. The second compares lung cancer death rates in migrants with those in their countries of origin and those in the countries to which they migrate and examines the changes in rates in the migrating population group with changes in environment. The third compares demographic units--including countries, states, cities, and metropolitan areas--and studies the relation between the lung cancer death rates and various indices of pollution, using multiple-regression techniques in an attempt to separate the effects of environmental and other factors. The fourth consists of sampling studies in which characteristics of lung cancer decedents are determined by family interviews and compared with the corresponding characteristics of the remainder of the population. Age, smoking, sex, race, level of pollution, and other factors were correlated with lung cancer mortality rates during these studies.

25736 **APTIC NO. 47154**

Colucci, Anthony V., Douglas I. Hammer, Marcia E. Williams, Thomas A. Hinners, Cecil Pinkerton, Jane L. Kent, and Gory J. Love

POLLUTANT BURDENS AND BIOLOGICAL RESPONSE. *Preprint, American Medical Assoc., Chicago, Ill., 14p., 1972. 8 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Current Environmental Protection Agency research efforts in the area of pollutant burdens are outlined. Human pollutant burden patterns may serve as indicators of environmental quality, as reflectors of biological response, as inputs into environmental standards, as channel markers for research, and as safeguards for pollution control and recycling technology. Preliminary observations, present problems, future needs, and goals of the EPA program are discussed. The level of metals in hair was studied as an indication of pollutant burdens. Blood, urine, and plasma have also been used as indicators. Tissues in mothers and infants have been analyzed for pollutant concentrations.

25737 **APTIC NO. 47155**

DeBias, D. A., C. M. Banerjee, and N. C. Birkhead

EFFECTS OF CARBON MONOXIDE INHALATION ON MYOCARDIAL INFARCTION IN MONKEYS. *Preprint, American Medical Assoc., Chicago, Ill., 10p., 1972. 4 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

While it appears that normal individuals may compensate for decreased oxygen availability resulting from 10-15% carbox-

yhemoglobin, the patient with heart disease may be unable to compensate. To test this hypothesis, normal monkeys and monkeys with induced myocardial infarction were exposed to 100 ppm carbon monoxide, and the physiologic effects on the cardiovascular system were evaluated. Hematological, electrocardiographic, and pathological changes in monkeys and dogs due to the CO exposures are described. Sensitivity to chronic CO inhalation is dose-related as well as species-related.

25738 **APTIC NO. 47264**

Hazucha, M., F. Silverman, C. Parent, S. Field, and D. V. Bates

SHORT TERM EFFECTS OF OZONE ON THE HUMAN LUNG. *Preprint, American Medical Assoc., Chicago, Ill., 15p., 1972. 15 refs. (Presented at Air Pollution Medical Research Conference, 13th, Chicago, Ill., Oct. 2-3, 1972.)*

Studies were designed to quantitate the effects of 0.75 and 0.37 ppm of ozone on different respiratory parameters obtained from normal subjects exercising intermittently in these atmospheres. All the maximal expiratory tests measured were altered significantly with 0.37 ppm O3 breathed for 2 hours. Those changes were probably due to a decreased lung elastic recoil, increased airway resistance, and small airway obstruction. The most sensitive tests are indicated. Smoking was also evaluated as a factor.

25739 **APTIC NO. 47153**

Lieberman, Jack and Charles Mittman

LEUKOCYTIC PROTEASES ROLE IN EMPHYSEMA. *Preprint, American Medical Assoc., Chicago, Ill., 11p., 1972. 8 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Evidence is presented supporting the postulate that leukocytic proteases may be intimately involved in the pathogenesis of pulmonary emphysema associated with alpha-1-antitrypsin (AAT) deficiency. The leukocytic proteases extracted from purulent sputum are capable of digesting human and animal lung tissues, and this enzymatic activity is strongly inhibited by the AAT from normal serum. Lung tissue may have affinity for binding AAT from serum, and this may have some therapeutic implications. The two mechanisms whereby antitrypsin deficiency may occur were also discussed: a block in the release of the Pi-ZZ antitrypsin from the liver cell, and increased lability of the abnormal AAT molecule in the serum. (Author conclusions modified)

25740 **APTIC NO. 47152**

Mittman, Charles, Teevee Barbela, and Jack Lieberman

INTERACTION OF ENVIRONMENT AND HEREDITY IN CHRONIC OBSTRUCTIVE LUNG DISEASE. *Preprint, American Medical Assoc., Chicago, Ill., 13p., 1972. 25 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Of the more than 20 alpha-1-antitrypsin phenotypes that have been described, the rare ZZ type is associated with a severe deficiency of serum AAT and predisposes to the development of chronic obstructive lung disease. Several phenotypes occur in up to 10% of individuals in normal populations and are associated with an intermediate AAT deficiency. These phenotypes were observed more frequently than expected in a group of 170 patients with chronic obstructive lung disease. The spectra of clinical and physiological findings are similar in patients with both levels of deficiency, but those with the intermediate deficiency develop overt disease later in life and after more intense and prolonged exposure to cigarette smoke and other environmental irritants. Pulmonary function studies in 144 presumably healthy subjects with the intermediate deficiency show evidence of anatomic emphysema, and early but definite obstructive changes are seen in over 1/3 of those who smoke. It is concluded that AAT deficiency predisposes the development of anatomic emphysema. (Author summary modified)

25741 **APTIC NO. 47157**

Sharp, C. R., V. Hasselblad, G. J. Love, J. Goldberg, J. E. Bumgarner, and E. J. Faeder

THE RELATIONSHIP BETWEEN CIGARETTE SMOKING, AMBIENT AIR POLLUTION, CHRONIC RESPIRATORY DISEASE SYMPTOMS, AND INFLUENZA ANTIBODIES. *Preprint, American Medical Assoc., Chicago, Ill., 8p., 1972. 5 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Efforts to determine the extent to which environmental factors might affect the production and persistence of antibody to influenza viruses have demonstrated that this measure of personal response might be an extremely useful tool for indicating the effects of pollution. Collection of 16,000 blood sera at the Chicago Induction Center offered an excellent opportunity to verify the results and to study the relationship between hemagglutination antibody levels, residual complement fixation antibody against influenza, ambient air pollution exposure, and the presence of chronic respiratory disease symptoms. Smoking effects were also studied.

25742 **APTIC NO. 47268**

Yagyu, H., I. Mizoguchi, K. Morozumi, Y. Sato, M. Osawa, F. Kano, K. Makino, and M. Chigusa

BIOLOGICAL EFFECTS OF OXIDANTS. *(Okishidanto no seitai e no eikyo). Text in Japanese. Kuki Seijo (Clean Air -J. Japan Air Cleaning Assoc., Tokyo), 10(5):82-89, Oct. 1972. 16 refs.*

The effects of photochemical smog, and specifically of its major oxidant constituent ozone, on human and animal health and plants were investigated. With respect to plant growth, the phenomenon of defoliation of plants and the stimulation to production of slime mold upon exposure to ozone were more remarkable than expected. In animal studies, fruit flies were more resistant to ozone than were mice. The major effects of ozone on humans were eye and respiratory irritation. Eye irritation was also tested in a smog chamber; acrolein and formaldehyde caused irritation, however, other oxidants caused irritation only after ultraviolet light was applied to automobile exhaust. The main respiratory syndrome was hyperventilation.

25743 **APTIC NO. 47166**

Yokoyama, Eiji

THE RESPIRATORY EFFECTS OF EXPOSURES TO SO2-NO2 MIXTURE ON HEALTHY SUBJECTS. *(Kenko jin haikino ni taisuru SO2-NO2 kongo gasu no eikyo). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 14(5):449-454, Sept. 1972. 21 refs.*

Seven healthy subjects were exposed to 12-13 ppm of sulfur dioxide, 14-17 ppm of nitrogen dioxide, and mixtures of the two gases to determine their effect on the respiratory system. Immediately before and after exposure, the forced expiratory volume (FEV 1.0), C(aw), and D(LCO) were measured. The C(aw)/FRC responses for one subject were relatively high as compared with other subjects. In four subjects, relatively large reductions were observed in the C(aw)/FRC after the exposure to the SO2-NO2 mixture as compared to changes after exposure to either of the gases alone; the mean of the reduction was 0.05/sec/cm H2O. The D(LCO) value tended to decrease, but the average change was not significant.

EFFECTS-PLANTS AND LIVESTOCK

1972

25744 **APTIC NO. 47178**

Craker, L. E.

DECLINE AND RECOVERY OF PETUNIA FLOWER DEVELOPMENT FROM OZONE STRESS. *HortScience, 7(5):484, Oct. 1972. 2 refs.*

Ozone can cause developmental changes in the inflorescence of plants. To discover if these changes are permanent, petunias were exposed to 5-7 microliter ozone for 6 hr/day, 5 days a week. Flower fresh weight and diameter decreased compared with controls growing in an ozone-free environment. Thirty-one days after the cessation of ozone treatment, the plant s new flowers had recovered to over 90% of the fresh weight and diameter of control plants.

25745 **APTIC NO. 47208**

John, Matt K.

LEAD AVAILABILITY RELATED TO SOIL PROPERTIES AND EXTRACTABLE LEAD. *J. Environ. Quality, 1(3):295-298, July-Sept. 1972. 19 refs.*

Lead contamination of the soil has been attributed to combustion of leaded gasolines, metal smelting, and insecticide sprays. Lead availability to plants and its relationship to soil lead and other soil properties were studied. The lead content of lettuce and oats was related to lead extracted from 29 contaminated soils by several different extraction procedures. Correlation studies showed that 1N nitric acid extractable lead was significantly related to lead in lettuce; however, milder extraction with 0.01N nitric acid and 1N ammonium acetate provided a better correlation with lead content of oat shoots and roots. Soil properties, particularly soil pH, were also important when attempting to predict plant lead. Lead availability was related to soil pH, extractable aluminum, and total nickel. No relationship with organic matter was observed. (Author abstract modified)

25746 **APTIC NO. 47106**

Seem, R. C., H. Cole, Jr., and N. L. Lacasse

SUPRESSION OF OZONE INJURY TO PHASEOLUS VULGARIS PINTO III WITH THIARIMOL AND ITS MONOCHLOROPHENYL CYCCLOHEXYL ANALOGUE. *Plant Disease Reptr., 56(5):386-390, May 1972. 14 refs.*

Two systemic fungicides, alpha-(2,4-dichlorophenyl-alpha-phenyl-5- pyrimidine-methanol (triarimol) and alpha-(2-chlorophenyl)-alpha- cyclohexyl-5-pyrimidinemethanol, suppressed ozone injury to 11-day-old greenhouse and growth-chamber-grown Phaseolus vulgaris Pinto III (pinto bean) seedlings fumigated with air containing 25-35 pphm of ozone for 4 hours. Treatments included soil amendments of 2, 5, and 10 micrograms/g of soil and foliar sprays of 20, 50, 100, and 200 micrograms/ml of spray solution. Both materials resulted in significant reduction of injury at soil amendment levels as low as 2 micrograms/g of soil. With triarimol, foliar sprays at dosages as low as 50 micrograms/ml of spray solution resulted in a four-fold reduction of injury. With the soil amendments severe internode shortening was noted at the highest dosage. (Author abstract)

1971

25747 **APTIC NO. 47286**

Daessler, Hans-Guenther

PLANT DAMAGE FROM AIR POLLUTION. *(Vegetationsschaeden als Folge der Luftverschmutzung). Text in German. Wiss. Z. Tech. Univ. Dresden, 20(4):1171-1173, 1971.*

The problem of air pollution-induced plant damage in East Germany is outlined. Sulfur dioxide causes most of the damage in forestry and agriculture, followed by hydrofluoric acid and silicon tetrafluoride. Dust and soot emissions are less hazardous for forests, while they may cause damage to fruits and vegetables and unfavorably modify soil properties. Arsenic, lead, copper, and zinc emissions are especially harmful since they may result in reduced crops. Invisible physiological, chronic, and acute plant damage due to pollution are distinguished. Exposures over a short time to high pollutant concentrations are generally more hazardous than long-term exposures to low concentrations. The total forest damage area in East Germany is estimated at 220,000 ha. Pollution induced damages of barley and flax, as well as livestock damages due to the consumption of contaminated forage have occurred repeatedly. As the proportion of fossil fuels among the energy sources steadily increases, no decrease in the SO2 level is expected. There are no effective means for controlling SO2 emissions, and the construction of high stacks constitutes no real solution to the emission problem.

1871

25748 **APTIC NO. 47200**

Stoeckhardt, A.

STUDIES ON THE HARMFUL EFFECT OF SMOKE EMISSIONS FROM METALLURGICAL PLANTS AND COAL FIRINGS ON THE GROWTH OF PLANTS, ESPECIALLY OF PINE AND FIR. *(Untersuchungen ueber die schaedliche Einwirkung des Huetten- und Steinkohlenrauches auf das Wachsthum der Pflanzen, insbesondere der Fichte und Tanne). Text in German. Tharandter Forstl. Jahrb., no. 21:218-254, 1871.*

Cases of forest damages due to metallurgical plant emissions, and experiments on the effects of sulfur dioxide, arsenic, lead oxide, soot, and coal smoke on various plants are described. Gradually decreasing timber production and damaged trees in a coniferous forest near a metallurgical plant were observed. Snow, soil, and needle samples contained sulfuric acid, lead, and arsenic. Smoking tests revealed that SO2 in concentrations harmless for plants in short-time exposure may be harmful in chronic exposure, and that deciduous trees are the least sensitive, followed by most agricultural plants, while conifers are most sensitive. A SO2 concentration of 0.0018% by volume rapidly damaged wheat, oats, and peas, while a smaller concentration of 0.00135% was fully ineffective. Arsenic in the form of vapor was much less harmful than in the form of solutions absorbed by roots or stems; its effect was negligible compared with that of SO2. Lead oxide caused no damage to the test plants, and neither did soot in itself, which indicates that practical damage from soot is attributable to its SO2 content. While wood smoke was harmless for plants, plant damage due to coal smoke was traced to the sulfur content in such fuels.

EFFECTS-MATERIALS

1972

25749 **APTIC NO. 47291**

THE CATHEDRAL RACES AGAINST TIME. *(Der Dom im Wettlauf mit der Zeit). Text in German. Umwelt (Duesseldorf), 2(6):38-39, 1972.*

Pollutants in the air are destroying the figures on the cathedral in Cologne, its glass windows, and its ornaments. Wind and weather together with sulfur dioxide from combustion processes, hydrofluoric acid from chemical and metallurgical

plants, hydrochloric acid, from incinerators, and trace metals such as vanadium and iron which are catalytically active, constantly attack the structure. Measurements at various heights of the acid waste gas components have already revealed that the sulfur dioxide exposure has reached an extent which is comparable to that in Duisburg.

EFFECTS-ECONOMIC

1972

25750 **APTIC NO. 47298**

Kinney, Gene T.

FUEL DEFICITS THREATEN CLEAN-AIR REGS. *Oil Gas J., 70(35):40-41, Aug. 28, 1972.*

A study of low-sulfur fuel supplies, conducted by a private firm for the Environmental Protection Agency, projects a deficit in low-sulfur fuel oil of 390 million bbl in 1975 and 350 million in 1977; a deficit in natural gas of 423 billion cu ft in 1975 and 1.5 trillion cu ft in 1977; and a shortage of low-sulfur coal of 324 million tons in 1975 and 325 million tons in 1977. In view of the shortages, it may be impossible to meet the state implementation plans for clean air standards now being considered for approval by the Environmental Protection Agency. State sulfur oxide emission limits and sulfur-content-in-fuel limits for 1975 are listed.

25751 **APTIC NO. 47202**

Rossie, John P., Edward A. Cecil, and Rodger O. Young

COST COMPARISON OF DRY-TYPE AND CONVENTIONAL COOLING SYSTEMS FOR REPRESENTATIVE NUCLEAR GENERATING PLANTS. *Beck (R. W.) and Associates, Denver, Colo., Atomic Energy Commision Contract AT(04-3)-848, Rept. TID-26007, UC-80, 134p., March 1972. 10 refs.*

NTIS: TID-26007; GPO

The estimated effects on total bus-bar costs of energy from three nuclear generating plants if dry-type cooling systems were installed instead of the conventional cooling systems were determined. Dry-type cooling systems discharge the waste heat associated with the production of electrical energy by steam electric generating plants directly to the atmosphere. There are no evaporative losses and no waste heat is discharged to rivers, lakes, reservoirs, or the ocean. Conventional evaporative systems cool by evaporation and conventional once-through systems discharge waste heat into a body of water. An alternative to the use of small supplemental wet cooling towers to supply cooling water to the plant auxiliary equipment would be a mechanical refrigeration system which would increase the bus-bar cost of energy from the dry cooled plant by approximately 0.06 mill/kWh. Data on cost variables and advantages of dry cooling are examined.

STANDARDS AND CRITERIA

1972

25752 **APTIC NO. 47283**

Central Public Nuisance Council (Japan) and Automobile Public Nuisance Council (Japan)

LONG-TERM ESTABLISHMENT OF MAXIMUM ALLOWABLE STANDARD FOR AUTOMOTIVE EXHAUST GASES. *(Jidosha haishutsu gasu kyoyo gendo choki seitei hosaku ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 8(10):960-963, Oct. 1972.*

The goals for 1975 and 1976 for automotive exhaust maximum allowable standards, the necessity of standards, new indexes, and the methods of achieving the tolerable air qualities are discussed. Transitions of vehicles in the main nations of the world between 1955 and 1970, the transition in the number of automobiles of various nations, highway congestion indexes in various parts of Japan, and numbers of automobiles on highways in main cities of the world are presented by tables. According to the table, the number of automobiles/sq km of highway is 18,800 in Los Angeles, 5600 in New York, 5900 in London, 4900 in Paris, 7400 in Berlin, 20,600 in Hamburg, 28,600 in Metropolitan Tokyo, and 22,100 in Osaka. The goal for 1975 for the average emission quantity for a newly produced automobile was set at 2.1 g of carbon monoxide, 0.25 g of hydrocarbons (eliminating evaporation and blowby gas), and 1.2 g of nitrogen oxides. After April 1976, newly produced automobiles should limit nitrogen oxides emission to 0.25 g/l km of operation. These should be achieved by improvements of presently used engines, development and improvement of catalyst and refractory material, research, development and manufacturing of control mechanism, establishment of inspection systems for clean performances, improvement on gasolines, and by enforcement of automobile inspection system.

LEGAL AND ADMINISTRATIVE

1972

25753 **APTIC NO. 47101**

Ministry of Transportation, Tokyo (Japan)

WHITE PAPER ON TRANSPORTATION, 1972. *(Showa 47 nendo-ban, Unyu hakusho). Text in Japanese. 492p., Oct. 1972.*

This comprehensive report on transportation includes a section on accidents and air pollution by automobiles. According to the present regulation, the emission standard of carbon monoxide is maximum of 2.5% concentration. Since Jan. 1971, clauses were added for liquid petroleum gasoline cars, for which the maximum concentration of CO is less than 1.5% and for light automobiles for which the standard is less than 3%. The CO concentration for all cars in the idling mode must be less than 4.5%. Installations of a blowby gas circulation system and a fuel evaporation control system are mandatory by the present regulations. As a step toward the development of low-pollution automobiles, the Ministry of Transportation is presently developing a hybrid mini-bus using both thermal and electric engines.

25754 **APTIC NO. 47292**

INTER-INDUSTRY EMISSION CONTROL. INTRODUCTION. *SAE (Soc. Automot. Engrs.) Spec. Pub., no. 370, 2p., 1972.*

The Inter-Industry Emission Control Program was formed by Ford Motor Co. and the Mobil Oil Corp. as a 3-year cooperative research effort on automotive emission control. Five American, three Japanese, and one Italian companies have joined the program. Automobile emission targets were established for hydrocarbons, carbon monoxide, and nitrogen oxides in accordance with the Federal Test Procedure.

25755 **APTIC NO. 47487**

Benson, Ferris B., R. C. Dickerson, Thomas D. English, Marvin B. Hertz, R. M. Burton, and David O. Hinton

SURVEILLANCE OF AIR QUALITY: A BASIC REQUIREMENT FOR HEALTH EFFECTS STUDIES. *Preprint, American Medical Assoc., Chicago, Ill., 14p., 1972. 3 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

Assessment of human exposure to environmental contaminants requires unique strategies in order to provide meaningful information for health effects studies. The Community Health Air Monitoring Program (CHAMP) was developed to support the Community Health Environmental Surveillance Studies (CHESS). CHAMP represents the state of the art for evaluating ambient air quality exposure. CHAMP contains continuous air monitoring instruments which provide for continuous on-site analysis of specific air pollutants and meteorological information. A telemetry system in each station makes possible the instant availability of data and the development of an effective quality control scheme. Development of personal monitoring devices is a prerequisite for determining the true human environmental exposure. Recent innovations in the aerospace field make personal monitors a distinct possibility. A knowledge of past exposure history of a health study area is a necessity for the determination of environmental effects on chronic diseases. Concentrations of sulfur dioxide, sulfur oxides, and dust in New York City and SO2 measurements in Utah are mentioned. (Author summary modified)

25756 **APTIC NO. 47223**

Chovin, P.

THE ATMOSPHERIC POLLUTION IN URBAN AREAS. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 541-546. (Oct. 17-19.)*

Some technical aspects of pollutant monitoring within an urban area are considered, in addition to adequate regulations, the role of the administrator, and the role of industry. Specific references are made to Paris, functions of the inspectors, motor vehicle regulations, and efficient fuel policies.

25757 **APTIC NO. 47297**

Fri, Robert W.

NATIONAL AMBIENT AIR QUALITY STANDARDS. APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. *Federal Register, 37(185):19829-19837, Sept. 22, 1972.*

Pursuant with the Clean Air Act, state plans for implementation of national ambient air quality standards were approved by the Administrator of the Environmental Protection Agency. California, New York State, and the District of Columbia, however, did not submit acceptable plans. Regulations setting forth a substitute implementation plan or portion thereof are given for the three states. The California plan corrects deficiencies in the control strategies for oxidants. Portions of the plan dealing with nitrogen oxides, particulates, procedures for reporting, record keeping, release of emission data, emergency episodes, and review of new sources remain disapproved. California s control strategy for photochemical oxidants (hydrocarbons) excepts some organic compounds which have a low reactivity in terms of oxidant production; the EPA will assess transportation controls for oxidants and determine if control regulations are needed for the exempt organic compounds. The District of Columbia s corrections to compliance schedules relating to sulfur in fuel are given. Revisions to the New York State plan are given for emission limits for sulfur oxides and nitrogen oxides and compliance schedules; these remain disapproved. The EPA will conduct a stack sampling program on incinerators and oil-fired combustion units to verify that New York s approved control strategy for particulate matter is adequate. After public hearings, proposed emission limits on NOx have been changed to be based on both the fuel and boiler types.

25758 **APTIC NO. 47248**

Kobayashi, Ikuo

RECENT AIR POLLUTION CONDITION AND CONTROL OF MOTOR VEHICLE EMISSION. *(Taiki osen no genjo to jidosha haishutsu gasu no kisei ni tsuite). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 313-324. (Oct. 17-19.)*

Rapid development of the economy between 1955 and 1965, the spectacular increase in energy consumption, the concentration of population and industrial plants in cities and their suburban areas, and the increased use and ownership of motor vehicles, have all contributed to the pollution problems which exist in Japan today. The annual average for carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, and particulate matter, as monitored during 1971 at three stations in Tokyo, is given. In view of the pressing situation resulting from automobile emissions, the government enacted the Air Pollution Control Law in 1968 to regulate automobile exhausts, and revised the law in 1970 to meet more stringent requirements.

25759 **APTIC NO. 47220**

Middleton, John T.

AIR POLLUTION CONTROL IN THE UNITED STATES. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 27-39. 9 refs. (Oct. 17-19.)*

The strategy for air pollution control in the United States is based upon attainment of ambient air quality standards protective of the health of man and his environment through emission limitations of stationary and mobile sources of pollution. Emission limitations may be achieved through regulation of pollution sources as stipulated in state implementation plans for the six principal pollutants, by application of national performance standards to selected industrial categories, designation of limits for hazardous pollutants, regulation of fuels and fuel additives, and promugation of motor vehicle emission standards. Further improvements in air quality will require improved control technology and more efficient resource utilization for stationary sources together with transportation and land use management constraints if the requisite air quality compliance schedule is to be achieved. Costs for this air pollution control are given, as well as the present estimates for combined air pollution related costs of human death and illness, and danage to property, materials, and vegetation. (Author conclusions modified)

25760 **APTIC NO. 47214**

Noguchi, Isamu and Takumi Watanabe

AIR POLLUTION MONITORING SYSTEM OF TOKYO. *(Tokyoto ni okeru taiki osen monitaringu shisutemu). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 521-539. (Oct. 17-19.)*

The Air Pollution Control Center of Tokyo monitors air quality on a continuous basis, makes statistical evaluations or meteorological interpretations of the data, and informs the public of its findings. If there is a threat of additional pollution which would reach high levels, notices are issued to this effect and major pollutant sources are required to reduce their emissions. In addition to the continuous monitoring system and the information system, there is also a system which monitors emission control at the major sources of pollutants.

25761 **APTIC NO. 47206**

Ruckelshaus, William D.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. HEAVY-DUTY ENGINES. *Federal Register, 37(175):18261-18270, Sept. 8, 1972.*

After evaluating comments and information, the Environmental Protection Agency has moved the date that emission standards and test procedures go into effect for heavy duty gasoline and diesel motor vehicles from 1973 to 1974. The standards and test procedures are very similar to the California 1973 regulations. Cost to manufacturers for compliance will be minimized because the manufacturers will be able to

obtain certification for California and the rest of the United States by following the same test procedure and only one fleet of test engines will be needed. Test procedures for smoke are described. Test engines, standards for exhaust emissions (hydrocarbons, nitrogen oxides, smoke, carbon dioxide, and carbon monoxide), test procedures, dynamometer operation cycle and equipment, calibration, analytical methods, and calculations are described.

25762 **APTIC NO. 47224**

Schueneman, Jean J.

PREVENTIVE TECHNOLOGY SYSTEMS FOR CONTROL OF AIR POLLUTION BY MULTIPLE SOURCES LARGE AREAS-OPERATIONAL SYSTEMS. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 547-565. 1 ref. (Oct. 17-19.)*

Governmental regulatory activities that are being taken to achieve the air quality goals are described. Emission inventories, construction permits, operating permits, pollution source surveillance, and enforcement procedures are discussed, as well as routine field patrols and periodic scheduled inspections. The control of sulfur dioxide emissions, soot from distillate oil burners, refuse incinerators, soot and fly ash from burning residual oil, and motor vehicle smoke and emissions is considered. Stack emission testing, the importance of visible emission regulations, and land use and transportation controls are also discussed.

25763 **APTIC NO. 47221**

Schwarz, K.

MEANS AND AIMS IN AIR POLLUTION ABATEMENT IN THE FEDERAL REPUBLIC OF GERMANY. *Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 15-26. (Oct. 17-19.)*

The Clean Air Commission of the German Association of Engineers has undertaken the task to determine the present state of knowledge with regard to the science and technology relevant to air pollution abatement, and to establish this knowledge in the form of guidelines which may be incorporated into the legislation and activities of the executive powers. Efforts of the Commission are cited. Environmental quality protection and aims of the government of the Federal Republic of Germany are discussed. The pollution control act is considered, as well as clean air, industrial emissions, emissions from households and small industries, and traffic emissions. Air pollution effects, the surveillance of air pollution, and research and development planning are discussed.

25764 **APTIC NO. 47168**

Wright, James R.

HIGHWAYS AND THE ENVIRONMENT: NEW PROBLEMS AND NEW OPPORTUNITIES. *Highw. Res. News, no. 48:37-46, Summer 1972. 60 refs.*

The challenge that now lies before transportation administrators and planners is to pull together disparate environmental standards, requirements, and research finding into an integrated environmental program. New socio-economic and environmental guidelines now being developed by the Federal Highway Administration as required by Congress in Section 136 of the Federal-Aid Highway Act of 1970 are designed to provide just such an environmental management process. Pollution control, highways in a living environment, resources and land use, and management of an environmental program are discussed.

25765 **APTIC NO. 47249**

Yamagata, Soroku

THE PRESENT CONDITION OF AND COUNTERMEAURES FOR AIR POLLUTION IN JAPAN. *(Nihon ni okeru taiki osen no genjo to taisaku). Text in Japanese. Union of Japanese Scientists and Engineers, Proc. Int. Symp. Air Pollut., Tokyo, Japan, 1972, p. 1-13. (Oct. 17-19.)*

The major sources and conditions of air pollution problems in Japan, and pollutants such as sulfur oxides, suspended particulates, nitrogen oxides, carbon monoxide, oxidant, and hydrocarbons are discussed briefly. The present countermeasures are discussed from the standpoint of administration; maximum allowable concentration of SOx, CO, suspended particulates are given, and control plans by regulations concerning emission sources, emission standards, emergency actions, monitoring systems, are briefly reviewed. As a systematic plan for decreasing the sulfur content in the air, the use of low-sulfur fuel (including imports), oil desulfurization, oil blending, stack gas desulfurization, the use of liquid natural gas, the use of city gas for heating and cooling systems are mentioned. Indemnity systems for the health victims of pollution are briefly mentioned. For the future, the sulfur content of congested areas in 1973 is to be lowered to 0.90%, for already polluted areas 1.30%, and for preventive areas, 1.45%. The total average for pollution control areas, the SOx content should be 1.20%. For 1978, for congested areas, the SOx content in the air should be 0.55%, for already polluted areas, 0.8%, for preventive areas 1%, and the total average should be 0.8%.

1971

25766 **APTIC NO. 47173**

Woodson, Riley D.

LOGICAL APPROACHES TO POWER SUPPLY AND ENVIRONMENT. *Proc. Am. Soc. Civil Engrs., J. Power Div., 98(PO2):181-186, Oct. 1972. (Presented at the American Society of Civil Engineers, and National Environmental Engineering Meeting, St. Louis, Mo., Oct. 18-22, 1971.)*

The environmental impact of supplying adequate electric power is discussed. Power facilities can cause noise; odors; change of appearance of the area; effects on water; health hazards from gases, vapors, particulates, and radioactivity from nuclear plants; degradation of the natural environment; reduction or elimination of limited natural resources; and effects on fishing, hunting, and agriculture. Planning guidelines for meeting environmental problems caused by the increased demand for power are listed, including consideration of cooling towers, control equipment, zoning.

SOCIAL ASPECTS

1972

25767 **APTIC NO. 47133**

Johnson, Dale L., Robert Allegre, Erica Burhrman, Sally Miller, Missy Sheldon, and Asher Rosen

AIR POLLUTION. PUBLIC ATTITUDES AND PUBLIC ACTION. *Amer. Behav. Sci., 15(4):533-561, 1972. 17 refs.*

Public attitudes regarding air pollution were studied when 122 residents of Pomona, Calif. were interviewed and 85 households in Claremont and Costa Mesa were given questionnaires. Pomona and Claremont are smoggy areas and Costa Mesa is a less polluted beach area. Age, occupation, social class, education, race, and political identification of the subjects were noted. All groups felt air pollution was a major problem. Many people reported depression or anger on smoggy days; 1/3 of the group reported physical irritation. Many people were bothered enough by environmental problems to support drastic actions to curtail it, such as banning insecticides and stopping all off-shore drilling to prevent oil spills. Seventy-seven percent of the respondents approved stopping the construction of smog-producing power plants, even if this

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